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The Dental Digest.

Vol. IX. CHICAGO, JANUARY, 1903. No. 1.

Original Contributions.

REGIONAL ANATOMY.

BY M. H. CRYER, M.D., D.D.S., PHILADELPHIA. READ BEFORE THE NATIONAL DENTAL ASSOCIATION, AT NIAGARA FALLS, JULY 28-31, 1902.

In 1885, when the "American System of Dentistry" was written, I had the honor of contributing the first two hundred and eighty-nine pages, the subject being "Regional Anatomy." At that time I thought the subject had been exhausted, but future surgical operations and dissections, carried on by other methods than those usually adopted in our dissecting rooms, proved that many statements of the general anatomists were erroneous, and that many important facts had not been brought to notice.

In 1895, at the meeting of the American Dental Association, the forerunner of this organization, I read a paper on the study of the maxillary bones, showing many new features of anatomy. At the meeting of this body in 1899 I read another paper on the same subject, still giving new ideas and facts upon the anatomy of the face. At this time it seemed that the subject had been nearly exhausted, and I began to compile the matter of various papers read before this and other societies into a book which has since been published, but even before this was completed I recognized that there was still much to learn from the surgical standpoint. It therefore gives me much pleasure to have this opportunity of presenting before the gentlemen of this Association some of my work of the past year.

The best teachers recognize that in order to guide the surgeon in his operations the study of anatomy for practical work should be done under such conditions as nearest approach life, and accepting this as a basis, many of our modern anatomists are following the plan of first injecting the body as soon as possible after death with a solution of formalin for hardening the soft tissues. The body is then covered with a coat of vaselin and wrapped in cloth or bandages to

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prevent evaporation, and placed in a refrigerator with a temperature of about 15 degrees F. After it has become thoroughly frozen it is ready for sectionizing. The saw should be a broad, thin blade with fine chisel-shaped teeth. In this way the finest bone can be cut without fracture and the soft brain tissue without displacement.

Fig. 1, before published, is a transverse bilateral section made from a dried skull. It gives a very good idea of the hard tissues and their relations, but the soft tissues are so shrunken that it is impos-

FIG. 1.

sible to form a correct idea of them or their relations to the hard tissues. Even the lining of the air cells is thinner than in the living subject. The following illustrations are made from frozen sections as before described, and will give a much better idea of the relative size and character of the structures, with the associated parts, than it would be possible to get in a dried specimen.

Fig. 2 is a posterior view of a vertical bilateral section of a skull cut in the region of the upper first molars, disclosing the various structures and spaces. Commencing at the top there is the skin, the

superficial fascia, frontalis muscles and pericranium. Below this is the cut edge of the frontal bone, the sections being made to expose the frontal sinuses, which are larger than common, with their septum, which deflects slightly to the right side of the median line. The sinuses pass remarkably low between the eyes. From the left side there is a piece of wire passing from the sinus directly downward through the infundibulum, the hiatus semilunaris and the ostium maxillare into the maxillary sinus. Below, and a little outward from the frontal sinuses, are the transverse sections of the orbits with the tissue of the eye in position, showing in this tissue some of the cross sections of the recti muscles of the eye. The dark inner membrane is the choroid coat. Between the orbits are found cross sections of the anterior ethmoidal cells, the unciform processes, the hiatus semilunaris, the middle turbinate bones, and the septum of the nose, which passes downward to the floor of the nose over the intermaxillary suture. There is a slight spur on the right side of the septum. In the lower portion of the nasal fossa are cross sections of the inferior turbinate bones. Below the orbits are two almost typical maxillary sinuses. External to the walls of the sinuses are the muscles of the face which pass downward to the mandible. Passing through these muscular tissues are arteries, veins and nerves. The cross sections of the mandible are shown, but the teeth are lost. The teeth, the alveolar process and the roof of the mouth are nearly typical in their formation. The tongue will be seen to more completely fill the oral cavity than is generally supposed, which will be more fully described further on. See also Fig. 4. The tongue nearly fills the space from the anterior teeth to the postpharyngeal wall, and from the molar and premolar teeth on the right side to those on the left. It also extends from the floor of the mouth to the hard and soft palate, and so nearly fills the mouth that to breathe through it with the teeth in occlusion would be somewhat difficult, and it is for this reason that "mouth-breathers" must separate the teeth when breathing. In various portions of the tongue may be seen the transverse sections of the nerves and vessels. Below the tongue is the floor of the mouth, the mylo-hyoid muscles, extending from the mylo-hyoid ridge on one side to the raphe, and then to the mandible of the other. Below this is a slight portion of the submaxillary gland, beneath which are the fascia and the integuments of the chin.

Fig. 3 is a similar section to Fig. 2, giving an anterior view. Immediately below the dome of the skull are the meninges. It will be seen that the membranes in the center dip downward to form the falx cerebri, and in the region where the section has been made the lower edge is attached to the posterior portion of the crista galli. At the top of the falx cerebri is a V-shaped cross section of the

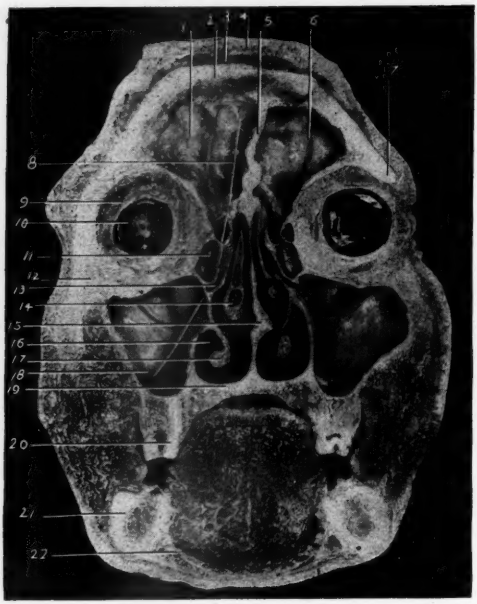


FIG. 2.

1. Frontal sinus. 2. Frontal bone. 3. Frontal muscle. 4. Skin and fossa. 5. Septum. 6. Frontal sinus. 7. External angular process. 8. Wire passing from frontal to maxillary sinus. 9. Tissue of eye. 10. Choroid coat of eye. 11. Anterior wall of bulla ethmoidal. 12. Malar bone. 13. Hiatus semilunaris. 14. Middle turbinate bone. 15. Septum. 16. Inferior meatus. 17. Inferior turbinate bone. 18. Maxillary sinus. 19. Hard palate. 20. First left maxillary molar. 21. Section of mandible. 22. Mylo-hyoid muscle.

longitudinal sinus. The frontal lobes of the brain show various convolutions, and it will be noticed that they are not symmetrical. Immediately below the brain are the thin inner walls of the frontal sinuses, showing that in this case the sinuses pass well backward and outward over the orbits. The outer wall of the sinuses forms a por-

tion of the inner and upper wall of the orbits. Below the sinuses are shown the cross sections of the orbits and eyes, the various recti muscles of the eye, the optic nerve, the ophthalmic arteries and veins. Between the orbits are the cross sections of the middle ethmoidal cells. Within the nasal chamber are cross sections of the septum and the middle and inferior turbinate bones. On the right side of the lower portion of the nasal fossæ are the maxillary sinuses, showing their posterior walls. For the general description of the lower portion of this figure see the description of Fig. 2, with the exception that the tongue is irregular in its outline, caused by the contraction of the alveolar arches.

Fig. 4 shows how the face can become narrowed or compressed until the maxillary sinuses are lacking. The alveolar processes do not extend outward and down in a curved direction, as shown in Figs. 1 and 2, but descend almost vertically. The two cross sections of the mandible are closer together than those in Figs. 1 and 2. Through the narrowness of the mouth the tongue is much crowded, and its upper outline is much deformed instead of being like that in Fig. 2.

Fig. 5 is a posterior view of a vertical transverse section of a skull which is far from being typical. From above may be seen the skin and the tissue covering the cranium and part of the anterior wall of the anterior fossa of the brain-case. Below this and above the orbits are the frontal sinuses. In this particular skull there was not a complete posterior wall to the left frontal sinus. The brain, apparently in normal condition, was extended forward to the anterior wall of the sinus, filling it completely. Had the surgical operation for tapping the sinus been performed, the brain tissue would have been reached in this case. The transverse sections of the orbits and eyes are fairly well shown; the ethmoidal cells are not so distinct as in the nearly typical skull shown in Fig. 2. The nasal fossa is very much deformed, caused by contraction, and the septum is deflected to the right side, coming in contact with a deteriorated inferior turbinate bone. The upper jaw and the tongue are narrow, while the palatal process has become thickened. There are also processes of the tongue extending laterally into the spaces unoccupied by the lost teeth, and the cheek on the right side has passed inward until it has become overlapped by the tongue.

Fig. 5, made from the same skull as Fig. 4, is an anterior view of a vertical transverse section cut just back of the posterior nares.

From above may be seen the skin and the tissue between it and the skull. Beneath the dome of the skull a cross section of the parietal lobes of the brain is seen with the falx cerebri between them, from their upper portion the falx cerebri extends downward to the corpus callosum, beneath which may be seen the cross sections of the lateral ventricle of the brain. Under the parietal lobes on each side are the cross sections of the temporo-sphenoidal lobes, with the body of

FIG. 3.

the sphenoid bone between them. The most important feature of this section to the stomatologists, and to those who make a special study of the treatment of these parts, is that the naso-pharyngeal space has become almost closed by the enlargement of the glandular tissues of this region, which will be again referred to. If that portion of the tongue back of the transverse section should be removed, it would expose the tip of the uvula, the tonsils, the palatoglossi muscles, the postpharyngeal wall, and the anterior convex portion of the epiglottis as shown in Fig. 6.

Fig. 6 is a similar section to Fig. 5, but from another skull. The brain is not well defined in the illustration; the sphenoidal sinuses are shown. The air passage leading from the nose into the pharynx is not closed, as shown in Fig. 5. The posterior portion of the tongue has been removed, thus exposing what is usually known as the oral pharynx, with the soft palate and uvula above. The post-pharyngeal wall is at the back, while the tonsils are at the sides. A little laterally and partly covering them are the two palatoglossi muscles. Below this is the oral or convex surface of the epiglottis. Beneath the oral pharyngeal space is part of the base of the tongue, and the epiglottis, while below this is a longitudinal section of the larynx. At the sides and above are sections of the thyroid cartilages, with the sections of the cricoid cartilages below. The space of the larynx is between these four cartilages. A little above the thyroid cartilages may be seen the cross sections of the greater cornua of the hyoid bone.

Fig. 7 is also a similar section to Fig. 5, giving a posterior view, though cut a little further back. The Island of Reil is shown in the cross section at a point where the temporo-sphenoidal lobes unite with the parietal lobes. The rounded space in the center of the base of the brain is the pocket which contains one-half of the pituitary body. On the outer boundary of this space are the internal carotid arteries passing upward and assisting in forming the Circle of Willis. Below the outer portion of the temporo-sphenoidal lobes the section passes through the anterior portion of the glenoid fossa and the condyloid processes of the mandible, beneath which may be seen the distal portion of the rami. Below the body of the sphenoid bone is the soft and muscular tissue of the postpharyngeal wall, and under this is the opening looking forward into the mouth. The palato-pharyngeal muscles are on the sides and between these muscles and the rami of the mandible may be seen various cross sections of nerves and vessels.

Fig. 8 is a sagittal section through the center of the head and the face. To fully describe the anatomy shown in this section would require more time than is allotted to me, and I will therefore speak only of some of the most important parts. Beneath the dome of the skull may be seen the inner right half of the cerebrum, below its posterior portion is the cerebellum, with the corpus callosum, corpora quadrigemina, peduncle and pons Varolii, with the medulla and spinal

cord passing downward. Between the cerebellum and the medulla is the fourth ventricle. In front of the spinal cord are sections of the bodies of the vertebræ; the white intervertebral substance may be seen between them. In the upper portion of this section of the face may be seen the right frontal sinus, with the crista galli just posterior to it, below this is the right nasal fossa with its turbinate bones and its meati. Posterior to the upper portion is the sphenoidal sinus.

FIG. 4.

Back of the lower portion is the posterior nares, where the nasal fossa opens into the upper portion of the pharynx. The floor of the nasal fossa extends from the anterior nares backward in a dome or convex-shape and terminates close to the postpharyngeal wall, leaving but a small opening in the median line. The incisor teeth are in about normal occlusion. The longitudinal section of the tongue and its radiating fibres are beautifully shown. The fibres commence principally from the genial tubercles, the upper fibres are the genio-

glossus, while the lower ones are the geniohyoglossus. At the base of the tongue is a transverse section of the hyoid bone. The epiglottis is well shown passing from the base of the tongue upward and backward until it nearly reaches the postpharyngeal wall. Below this is the larynx.

The Tongue.—Gray, Allen and other leading anatomists describe the tongue as being "situated in the floor of the mouth in the interval between the lateral portions of the body of the jaw." It is evident that they did their dissecting upon somewhat dried subjects, similar to that shown in Fig. 1, and when they examined the living subject it was naturally with the mouth open, and consequently the hyoid bone and all associated with it were drawn downward. When the mouth is closed in the normal living subject the tongue almost completely fills the space from the floor of the mouth to its roof, from the anterior teeth to nearly the postpharyngeal wall, and from the premolar and molar teeth on one side to those of the other, so much so that the sides of the tongue are more or less indented by pressure against the teeth, and the buccal surface of the cheeks is in somewhat the same condition, though when the mouth is thrown wide open those indentures are usually lost. If a tooth be lost the tongue will pass outward into the space that it occupied, while the cheek will pass inward endeavoring to meet the tongue. See Figs. 2, 3, 4 and 5. It is due to this cause that a space feels so large to the tongue when a tooth has been extracted, as it does not come in contact with the usual resistance when an artificial tooth replaces it, the tongue and cheek having nearly or quite met through the open space. See Fig. 5. The tooth feels large and uncomfortable, but in a short time the tongue becomes accustomed to the new tooth, or in other words, the soft tissues recede into the same position as before extraction.

It would be natural to suppose that the tongue, being so large and pressing outward, would have more or less influence in moulding the shape of the alveolar arches, but from observing various bilateral sections of the face shown in Figs. 3, 4 and 5 I would claim that the mouth has more to do in shaping the tongue than the tongue has in shaping the mouth. In Figs. 2 and 8 it will be noticed that the outer surfaces of the tongue are smooth and conform to the surfaces of the mouth, alveolar processes, and the teeth, while in Fig. 3, from a slightly narrowed skull, the tongue is somewhat compressed and

is irregular in its outline. In Fig. 4, from a much narrowed skull, the tongue is very much compressed and is quite irregular in its outline.

In Fig. 8 the epiglottis will be noticed at the posterior base of the tongue passing upward and backward. In discussing Dr. Roe's

FIG. 5.

paper,* the sudden collapse of his patient was thought by some to be due to the tongue falling backward, which caused the epiglottis to close over the glottis. This I thought was partly a mistake, as I do not believe that the epiglottis acts as a lid to the glottis. It is more of a stationary organ, and its nearest relation to the glottis is when the larynx is raised toward it, and even at that time the epiglottis is carried upward with the base of the tongue and the hyoid bone. Some years ago I made a number of experiments upon

*Dr. Roe's paper will appear in the February DIGEST.—ED.

several cats and dogs. After placing them under an anesthetic I opened the tissue covering the region of the glottis and epiglottis in order to obtain a general view of the parts, allowing the teeth to remain in occlusion. By passing water into the posterior parts of the mouth with a syringe deglutition was forced. The water passed backward and downward, and in the act of deglutition the folds of the glottis would close the opening, but no special movement of the

FIG. 6.

epiglottis could be observed, even when water was injected between the folds of the glottis. The epiglottis has sometimes been lost in man by disease and traumatism without interfering with the functions of the glottis, and in many of the lower animals no epiglottis exists at or near the glottis at the base of the tongue, showing that it is not necessary for this organ to protect the glottis. I have removed the organ from several cats and allowed the parts to heal over, with no apparent difference in the deglutition or breathing. As the epiglottis is a concavo-convex organ, with the convex portion toward the mouth, it will act as a shield to the glottis and cause the

fluids to go to the right and left as they pass the partly raised tissue surrounding it.

During the surgical operation for removing the condyles of the mandible, the principal reason for the patient's failing to breathe properly was, that this operation allowed the lower jaw, the hyoid bone, the tongue and all the surrounding tissues of that region to

FIG. 7.

fall backward against the postpharyngeal wall, closing the pharynx, and thus shutting off the air before it can reach the glottis.

The roof of the typical mouth before the loss of the teeth and alveolar process is dome-shaped, both transversely and antero-posteriorly, and extends nearly from the anterior teeth backward to the postpharyngeal wall. See Figs. 2, 3, 4 and 8. During deglutition it extends completely to the postpharyngeal wall. The wall advances slightly to meet the uvula and the free edge of the soft palate.

After studying specimens similar to those from which these specimens have been made, I have been much better able to construct obturators for defective palates.

Both the medical and dental professions usually speak of the high arch of the mouth, as though the median line had been forced upward. If the floor of the nose of such mouths be examined no ele-

FIG. 8.

vation will be found, except perhaps under the cartilaginous portion of the septum. The floor of the nose posteriorly is held down by the vomer, which is seldom deflected. The principal reason for the high arch or dome lies in the length and position of the alveolar process. Instead of passing outward and downward in a curved manner, it passes more downward and is more or less elongated. Therefore it is the position of the alveolar process that gives the appearance of a high arch, rather than the elevation of the center of

the mouth. As has been already said, this is brought about by the lack of the precisive force of the lower teeth against the upper ones.

There are several factors which have more or less influence in modifying the shape and size of the maxillary sinus, the roof of the

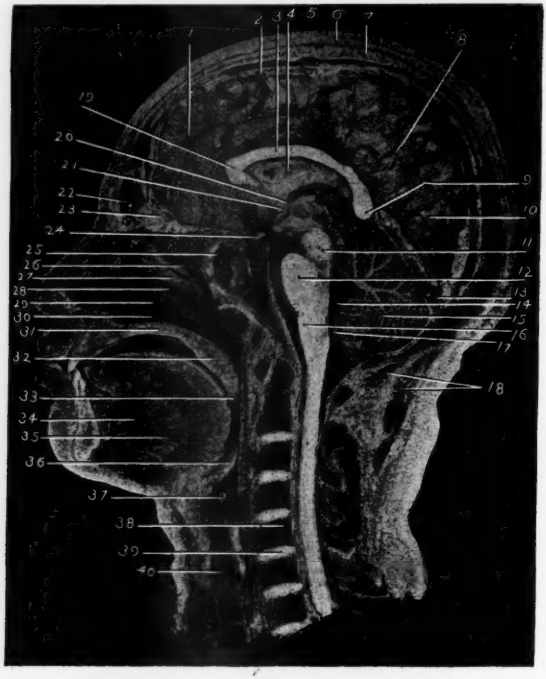


FIG. 9.

1. Frontal lobe. 2. Meninges. 3. Corpus callosum. 4. Septum lucidum. 5. Skin. 6. Occipito-frontalis aponeurosis. 7. Parietal bone. 8. Parietal lobe. 9. Splenium of corpus callosum. 10. Occipital lobe. 11. Peduncle. 12. Pons varolii. 13. Torcular of Herophilus. 14. Fourth ventricle. 15. Cerebellum. 16. Medulla. 17. Uvula. 18. Recti muscles. 19. Genu of corpus callosum. 20. Foramen of Monro. 21. Anterior commissure. 22. Frontal sinus. 23. Crista galli. 24. Optic chiasma. 25. Sphenoidal sinus. 26. Superior meatus. 27. Superior turbinate. 28. Middle meatus. 29. Inferior turbinate. 30. Inferior meatus. 31. Hard palate. 32. Soft palate. 33. Uvula. 34. Genio-glossus. 35. Genio-hyo-glossus. 36. Epiglottis. 37. Glottis. 38. Fourth cervical vertebræ. 39. Inter-vertebral substance. 40. Trachea.

mouth, the nasal cavity and the positions of the teeth, and among the most important of these are adenoid enlargements and congenital and acquired cleft palate. The partial or complete closure of the respiratory tract is sometimes caused by bony deposit near the pos-

terior nares, which may or may not be congenital, but the most common obstruction in this region is in the form of adenoid growths. Fig. 5 is a marked illustration, showing the growth of glandular tissue of this region. It will be noticed that the space is almost closed. The enlargement passes forward as well as backward, causing a deformity of the nasal chamber. This condition compels the person to breathe through the mouth, which distorts the normal action of the various muscles of the pharynx, the tongue, of mastication, and of the face, and influences in changing the character of the bony structures. The occlusion of the teeth is also interfered with. The occlusion or constant pressure of one jaw against the other is one of the greatest factors in properly placing the teeth and in modeling the jaws, and through shaping the jaws the nasal fossa with its pneumatic sinuses and cells is influenced, and even the orbit and vision may be influenced by the enlargement of the adenoid tissue of pharynx. With such closure of the posterior nares the treatment for irregularities of the teeth must begin with the removal of these adenoid growths. If this is not accomplished almost all the mechanical appliances or interference with the teeth will be useless.

These are only a few illustrations selected from over one hundred slides which I have made from new frozen sections during the past winter. The work has been intensely interesting and I think would repay anyone who is at all interested in regional anatomy of the head and face.

PREMATURE EXTRACTION OF DECIDUOUS TEETH.

BY H. A. PULLEN, D.M.D., BUFFALO. READ BEFORE THE NATIONAL DENTAL ASSOCIATION, AT NIAGARA FALLS, JULY 28-31, 1902.

One of the chief causes of complication in the diagnosis and treatment of malocclusion of the teeth, coupled with injudicious extraction of permanent teeth, is the premature loss of deciduous teeth by extraction or decay. The deciduous teeth are often wantonly sacrificed by the dentist, who, although he may be relieving suffering, seldom stops to consider the effect upon the harmonious development of the permanent teeth, trusting to Nature to bring about normal arches, no matter how badly she is abused. Again, caries is responsible for the premature loss of the deciduous teeth several years before the time for their successors to appear. Also, these

teeth are extracted by parents for their children without advice from the dentist.

The exact time for the natural loss of such teeth cannot be stated definitely, but varies with the individual, the tooth in question, and the prompt or retarded development of the succeeding permanent tooth. The ideal time is, of course, just when the permanent successor has reached the level of the alveolus, preparatory to eruption through the gum tissue, the roots of the corresponding deciduous tooth having been absorbed, permitting its easy removal.

Now, as to the effect of such loss upon the development of the permanent teeth in their correct position in the arches. If the deciduous tooth is extracted eighteen months or more before the time

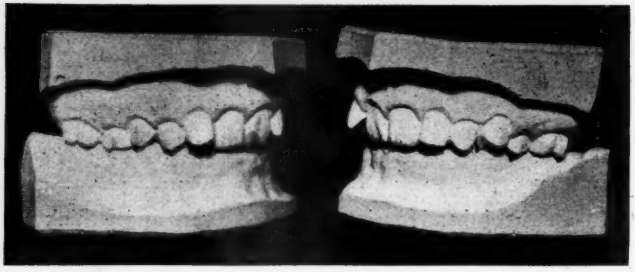


FIG. 1.

for the natural eruption of the successor, partial or complete closure of the space almost inevitably takes place, thus shortening the arch by the width of that tooth, and producing a lack of harmony in the relation of both jaws that is very apt to cause a serious irregularity unless operated upon in time. Interstitial growth of the jaw is interfered with at the same time, accounting for the lack of development in the region of the lost deciduous tooth.

Common observation reveals the fact that the deciduous teeth are very seldom irregular. We usually find harmony in size and shape of arches, jaws and teeth during the period of retention of the deciduous set as a whole. It is only when one or more of the deciduous teeth has been prematurely extracted that irregularities begin to manifest themselves, and these usually appear as shortened lateral halves, undeveloped arches, and consequent lack of room for the

erupting permanent teeth. The photographs of models illustrate cases in which deciduous teeth have been extracted, causing either primarily or secondarily some irregularity of the teeth.

On the first model, illustrated buccally and occlusally in Figs. 1 and 2, the cause of the irregularity is primarily from the loss of the inferior second deciduous molar on the left side. It will be noticed in Fig. 1 that the case belongs to Class I (Angle), the jaws being in normal relation from the first molars distally, the irregularity being confined to the teeth anterior to the first molars, and consisting in a contracted lower arch, principally on the left side where the space of the lost deciduous molar has been closed up. (See Fig. 2.) The lower incisors are considerably distal to their normal positions. As

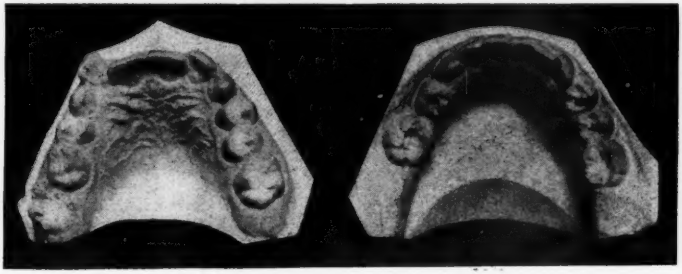


FIG. 2.

the upper centrals depend on the lower centrals for their support, the conforming of the upper arch to the lower anteriorly has produced a lingual inclination and position of the upper centrals, and an apparent labial position of the upper laterals.

That this serious irregularity should be caused by the premature extraction of a single deciduous tooth ought to be sufficient proof of their unit value, and a warning to the careless operator of the possible results of such extraction.

In the case illustrated in Figs. 3 and 4 the loss of the deciduous tooth is a secondary cause, the primary one being a general lack of development of the arches. The right and left buccal views of the case in Fig. 3 prove that it also belongs to Class I, the molars being in their normal relation and the irregularity confined to the anterior teeth.

Figs. 5 and 6 illustrate the undeveloped arches due to premature extraction of all the deciduous teeth before the age of nine years. The resultant effect upon the facial profile is very marked, both lips falling in, giving a senile expression to the features.

In the process of development of the jaw by the interstitial growth the wedge-like influence of each deciduous tooth plays a prominent part, hastening and stimulating the enlargement of the arches by the lateral pressure of the teeth in the arches. The permanent teeth require more space for their eruption than the preceding deciduous ones, on account of their larger size. One exception to this rule is the second bicuspid, which is considerably smaller than the second

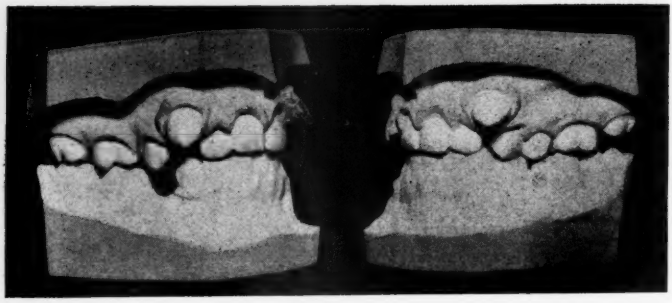


FIG. 3.

deciduous molar, which it succeeds. This increase of space is obtained by the lengthening of the lateral halves of the arches. When the first permanent molar begins to erupt it has to make space for itself between the second deciduous molar and the maxillary tuberosity and the ramus, above and below respectively. This pressure is felt by all the other teeth in each arch, and they are carried forward, coincidently with the natural development of the jaw.

If the second deciduous molar be extracted at this time, preceding the eruption of the first permanent molar, the wedging influence of the latter will be expended in moving itself forward into the space of the lost molar, and development on that side will be arrested, and inharmony in the size of the arches will be thus established. Also,

the second bicuspid has no space in which to erupt, and consequently will be forced into buccal or lingual occlusion on eruption.

Another tooth which is often prematurely extracted with the idea of making more room for the incoming permanent lateral is the deciduous cuspid. No greater mistake can be made than that of extracting deciduous teeth to make room for the permanent. While the premature loss of the deciduous molar and cuspid in either arch produces the most harmful results, the principle applies to the premature loss of any of the deciduous teeth, the difference being only in degree.

Drs. Angle, Goddard and Guilford in their writings most emphatically protest against the premature extraction of these teeth. The

FIG. 4.

former has suggested to us the mechanical retention of the space of a lost deciduous tooth until such time as its successor shall appear. This is easily done by banding teeth contiguous to the space, these bands being connected by a wire soldered to each band, or the same result may be obtained by a wire alone, fastened in pits in contiguous teeth and elongated by pinching. It is possible also to regain lost space by proper use of regulating appliances.

With regard to the premature loss of the deciduous teeth by caries, we have in the explanation to the parents of the harmful results of irregularities our most weighty argument in favor of filling the deciduous teeth. So important is it that the full space of each deciduous tooth be maintained until the eruption of its successor, that if its mesio-distal diameter become shortened by caries it should be restored by separation and filling.

Though not properly included in this paper, we might mention the fact that prolonged retention of the deciduous teeth is also a common cause of irregularities.

In either case the X-ray is most valuable in discovering the positions of the erupting permanent teeth, so as to aid materially in the treatment. Many times the permanent successor is missing, and the X-ray revealing its absence prevents us from making the mistake of extracting the deciduous tooth which would appear as retained too long.

One positive indication of the normal development of the anterior part of the arch is the separation of the deciduous incisors at about

FIG. 5.

the fifth year of age. This would tend to prove that at this age contact of the deciduous incisors is not needed to sustain the wedging influence of the other teeth in assisting the development of the arches. Previous to this time, however, there is no doubt but that each incisor, above and below, aids in the process of development by its mechanical influence alone. It is also true of all the other deciduous teeth, that when the succeeding permanent tooth has come up near enough to the alveolar border to sustain its proper space, the mechanical wedging influence of the deciduous predecessor is no longer needed for the proper eruption into normal position of the permanent tooth.

I do not wish to be understood as saying that premature extrac-

tion of deciduous teeth is the cause of every non-developed arch, but it is often the cause primarily. Many other conditions may be primary causes, and again, premature extraction of deciduous teeth may be a secondary cause of the undeveloped arches associated with the other conditions manifested primarily.

Deciduous teeth, on devitalization or ensuing abscess, should be treated and retained if possible. If incurable alveolar abscess supervenes and it becomes necessary to extract, the space should be retained in the manner before mentioned.

It would be wrong to advise non-extraction of an aching or abscessed deciduous tooth, unless the pain could be controlled, as the effect upon the little patient of prolonged suffering is very marked.

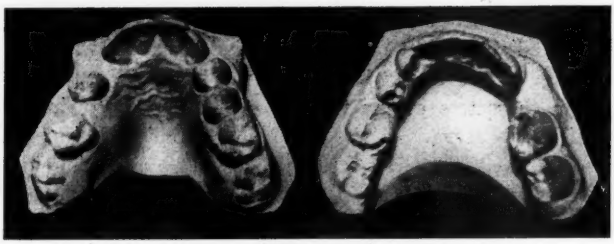


FIG. 6.

Also, pus from a sinus may by absorption into the system cause some form of septicemia, as noted in many cases, or result in harm to the alveolar border and developing permanent tooth beneath.

Dr. Goddard gives the following general and special rules for extraction of deciduous teeth: *General Rule*—Extract a deciduous tooth only when it deflects its successor. *Special Rules*—1. Do not extract a deciduous lateral to make room for a permanent central incisor. 2. Do not extract a deciduous cuspid to make room for a permanent lateral incisor. 3. Do not extract a deciduous second molar till the first permanent molar is firmly fixed in place, and not then unless the second bicuspid has erupted or is about to erupt out of position.

The only exception to these rules is that of incurable alveolar abscess, as before mentioned.

ETHNOGRAPHIC ODONTOLOGY; THE INCA PERUVIANS.

BY A. H. THOMPSON, D.D.S., TOPEKA, KAN. READ BEFORE THE NATIONAL DENTAL ASSOCIATION, AT NIAGARA FALLS, JULY 28-31, 1902.

It is not my purpose to tax your patience by making any extended apology or giving any explanation of the general value of the study of the ethnology of the teeth. That has been done elsewhere. Suffice it to say now briefly that my studies in comparative odontology have naturally led up to the subject of the comparative study of the teeth of the various races of mankind, with the object of differentiating the characteristic ethnic features. I have been greatly disappointed that the literature of the subject, in which I hoped to find data from which to form deductions, was not only very meager, but that what little has been written upon the ethnologic characters of the teeth is of little value, owing to the want of exact observations of the minute anatomical features of the teeth, which we, as dentists, are accustomed to observing in practice. I shall not attempt to discuss what has been written upon the general subject at this time, but confine myself to the presentation of some original work that I have attempted in one small field, and which is intended to be more suggestive than exhaustive. I shall not even try to present an analysis of what I have been able to glean from this field, but undertake the description only of what I have observed. We are not yet in possession of the data to make any generalizations or deductions in any field of dental ethnology, so that our first duty is the accumulation of facts and their classification. That is what I shall attempt in this paper—the presentation of classified observations in a very limited field. I hope also that this study will interest some of my hearers sufficiently to induce them to take up the investigation of some race that may lie at their hand, and thus contribute to the general fund of knowledge upon this important subject. We must have masses of facts, from which it is to be hoped in time that valuable deductions may be made, but that time is not yet, and we must avoid above all things too hasty generalizations.

I have been enabled to carry on some investigations upon the

teeth of the ancient Peruvians in various museums of the United States which are especially rich in their skulls. I made extensive and minute notes upon about 500 Peruvian crania, from various parts of that country, and while this is not a great number, they may be considered as fairly typical, and the averages would not probably be altered much in a larger number, considering the

FIG. 1.

Elongated, compressed skull of Peruvian of the plateau.

minute details noted. The conclusions, I think, may safely be trusted as fairly representative of the general characteristics of the whole people, but may perhaps be modified in some respects by further observations.

The ethnology of the Peruvian nations is very obscure and not well made out. Most writers speak of them as being rather heterogeneous, and that the empire of the Incas in its palmy days was made up of many various tribes which had been conquered and

absorbed into its body, but without much assimilation. Prichard says that, "The Andean family comprehends the principal nations of the South American Cordillira, including Peru, Chili, and some adjoining countries. These nations, though differing in language and manners, have certain traits in common. They are of a clear olive brown and small of stature. The Quichua or Inca Peruvians were the most important of this stock, among whom nearly all the civilization of South America existed. The Quichuas were the dominent race and had considerable mental culture and ability, and developed a wonderful civilization on the high plateaus of the Andes. The Quichua Peruvians were of small stature, so that the skulls are not large, and those of the Incas and upper classes are refined and delicate in structure, quite like the better class of Europeans. They are, indeed, quite of the type common to highly civilized nations. There is considerable uniformity within different groups, as with the large, coarse Aymaras of the Titicaca region, who dominated the plateau, and of the other group, the smaller and finer Quichuas of the coast and the Inca classes. These were mixed during the progress of the Inca consolidation of the tribes of the regions of Peru, for the Incas had the policy of all great conquerors —of moving and mixing populations. So the two main types of the bandaged long-heads of the Aymara, coarse peoples, whose home was the plateau, and the other group of the smaller, refined type, Quichuas of the coast, who flattened their heads, are mixed considerably by immigration. Still, they were not homogeneous and are readily distinguished by their peculiarities, both osseous and dental."

The skulls of the Peruvians are usually small or medium in size, and of the brachycephalic form, with a tendency to bulge at the parietals. The forehead is narrow and receding, and the glabella and superciliary ridges are not prominent, except in large, coarse skulls. The jaws are light and orthognathous, prognathism not being prevalent in the higher types. The head, being narrow at the frontal region, and wide and bulging at the parietals, presents a type that is striking and characteristic, but the most extraordinary thing about the Peruvian skulls is the artificial deformation that was practiced for the mere purpose, apparently, of changing the shape of the head in accordance with the dictates of fashion.

Prof. J. Wyman says, "The Peruvian crania present two modes

of artificial distortion commonly seen, namely, those from the chulpas or burial towers of the district of Lake Titicaca being lengthened, while those from nearly all other localities are broadened and shortened by flattening of the occiput. Round about Lake Titicaca and the region of the plateau are found the elongated skulls, which are altered in shape so as to be small in diameter and longer behind than normal. This was evidently accomplished in infancy, while the bones of the head were soft and pliable, by binding with thick, stout cords of hair and wool, wound round and

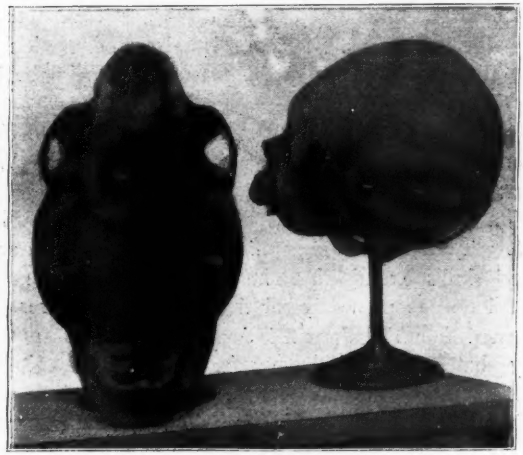


FIG. 2.

Flattened, compressed skull of Peruvian of the coast.

round. Skulls have been found with the tightly wound cords still in position. That children often succumbed to the cruel custom is evidenced by the number of young crania that are excessively elongated. These elongated skulls are found principally in the Aymara district, and it is supposed that this tribe inaugurated the custom, and it then extended to nearly all the region of the plateau and thence down to the coast. Along the coast the fashion of compressing the skull was different. The head was flattened from forehead to occiput as if between boards, so as to project greatly at the parietals. This was the style at Pachacamac, Aucon, and other

coast places. This form is quite like that of the Flathead Indian and other tribes of the Northwest coast of North America. The bulging of the parietals is very marked, and is not always symmetrical, but often "lop-sided," so to speak. One side apparently got the better of the other and soon went beyond control and bulged permanently more than the other. A deep valley often ran over the parietal suture between the bulged sides."

M. D'Orbingy observes, "In the flattening of the frontal bone, in the projection that it forms over the bones at the upper part, there has evidently been compression before and behind, which has forced the mass of the brain backwards by pushing, as it were, the frontal bone over the parietals. . . . There is also obliteration of the sutures at all points affected by the pressure, even in the heads of the youngest subjects."

Our especial interest in these compressed crania is to observe if the custom had any effect upon the form of the jaws. We might expect that the distortion of the bones of the cranium would affect the position and articulation of the upper maxillary at least and cause deformity of the arch, but this was not observed in any of the compressed skulls examined. The arch was full and normal and of beautiful outline in nearly all that had full dentures. Neither the elongated nor the flattened forms seemed to present any deformity that might not have arisen from congenital causes. There were deformed jaws, of course, and some of them were associated with the artificially compressed skulls, but it was not apparent that the deformity could have been in any way connected with or due to the compression.

One interesting feature was the frequency of the Inca bones in the lambdoid and parietal sutures, especially the former. They occurred with great frequency, of every size and location in these sutures, the most common perhaps being a large triangular bone at the junction of the sutures. The Incas made a specialty of them, so that the old name for these aberrant elements in their anatomy seems quite appropriate.

A conspicuous facial feature was the high nose, which the Incas and aristocratic classes possessed as an evidence of blue blood. It was a distinctly aristocratic feature, as is shown by the high nasal bones of the Inca. Mr. Squier found some of the descendants of the Peruvians in modern Chimu whose profiles compared with those

of the portrait vases found in the ruins of Grand Chimu. Portraits of the Incas are also seen with this aristocratic feature, having noses quite of the high Roman type.

A matter of remarkable interest in the skulls of the ancient Peruvians was the number that had been trephined. This operation seems to have been a veritable medical fad among them, if we may judge by the number of skulls that have been operated upon. The operation was evidently performed with a graver or chisel, by sim-

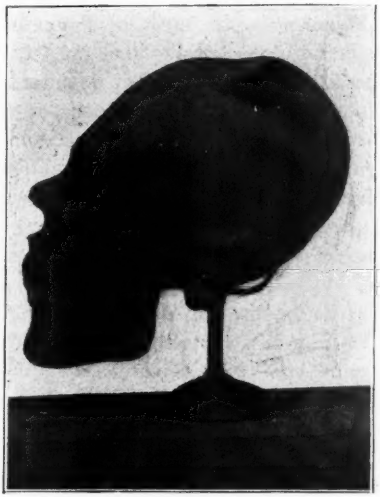


FIG. 3.
Elongated Inca skull, with double trephine.

ply gouging out four lines that crossed each other and cutting out a square piece. It makes us shudder to think of the operation. Let us hope that they humanely employed the narcotic and anesthetic effects of the coca plant which they used so extensively. That they survived the operation is attested by the skulls that have been found in which the trephined space is partly or entirely closed, with signs of inflammation of the bone. Other skulls show that the victim died before the operation was completed, as it was left unfinished.

The purpose of the operation is not quite clear. It may have had a superstitious significance, but that it was a fad or fashion there

seems no doubt. It was probably a medical fad, like blood-letting in our grandfathers' days, and that they had the courage of their convictions the many skulls operated on attest. One reason for performing it probably was for injuries, and as a surgical procedure the treatment was rational. Small perforated wounds of the skull, such as would be inflicted with the star-like stone or bronze club that they used, or spear or arrow heads, would need just such an operation, and there are skulls with such injuries that have been treated by trephining.

The Teeth in General.—The teeth of the Ancient Peruvians presented some general characteristics that must first command our attention. In the first place, having an advanced civilization, we find some corresponding effects on structure due to such environment, as might be expected. Observations made on the skulls show that their civilization and luxurious surroundings, such as they were, had an effect upon the jaws and teeth, resulting in disease, deformity, irregularities, missing teeth, contracted jaws, delicate bones, etc., among the better classes. The writer was reminded that we would need to remodel our concepts in regard to the effects that civilization has had upon the teeth. A half century ago it was quite the fashion to assume that savage and prehistoric people had better teeth than civilized nations, and because they lived closer to nature and ate coarser food. Then some extensive investigations carried on in different countries on savage and prehistoric skulls disclosed the fact that there was much dental disease and deformity among them, and the pendulum swung too far the other way, and that is where we are to-day. But in the presence of the disease and deformity exhibited by the cultivated Peruvians, we will evidently need to remodel our theories again and return in a degree to the ideas of the pioneers of fifty years ago. This, of course, with some modification as to the prevalence of defective structure and disease as between savage and civilized nations. Here we have an ancient people, but one with considerable culture and living in luxury. Of course there was considerable abrasion of the occlusal surfaces, as might be expected with their usual diet—maize, with its abrading silicious covering of the grain, the grit that entered into the meal prepared in stone mills, and other forms of coarse food. There was much evidence of alveolar abscess from this abrading and exposure of the pulp. Great cysts in the jaws

told stories of suffering that were only too plain. No adult skulls were observed in which there was not considerable abrasion, and in the older ones it was very destructive. Only in the young skulls could the pattern of the occlusal surfaces be made out minutely. This wear of the teeth was probably often caused, as in the modern Peruvians, by chewing the coca leaf with its own silica, mixed with a gritty substance called *Llute,* made of wild potato, calcined shells and ashes of cacti, or other plants rich in alkali.

There was some caries which was occasionally very destructive, but not a great amount. The percentage of carious teeth was very small.

Considerable salivary calculus was found in some skulls, but not many where it was present in great quantity. It was often as-

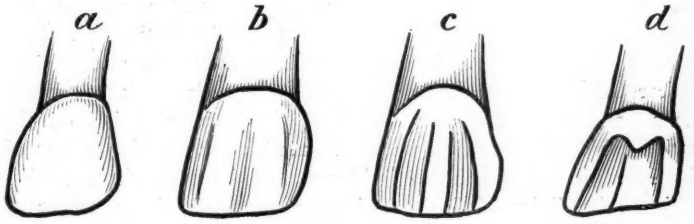


FIG. 4.

Upper centrals from Peruvian skulls. *a.* Narrow neck. *b.* Wide neck. *c.* Ridges on labial face. *d.* Ridges on lingual face.

sociated with teeth that were extensively carious, and the disuse of one side had allowed calculus to collect on that side. The deposit was often discolored brown or green, which was probably due to the excessive use of coca leaves.

A remarkable circumstance was the frequent occurrence of teeth that were stained by coca leaves to a dark green or blue. This habit was and is to-day a most remarkable one. The leaves of the plant, *erythroxylon coca,* were considered sacred and the chewing of the leaves was accompanied with considerable ceremony. The plant has always been extensively cultivated in Peru and the use of it is of great antiquity. It is both stimulant and narcotic, and the habitual user requires very little food. Tschudi says "That all who masticate coca have pale lips and gums, and greenish teeth." As the leaves are mixed with unslacked lime in chewing, it is not

surprising that the stain should be thorough and permanent. It would be interesting to make microscopic sections of coca-stained teeth to see how deeply it extends. It does not seem to be deleterious to health when not used immoderately among the Peruvians of to-day. Laborers demand it in order to sustain prolonged exertion, which it undoubtedly does. The amount of fatigue which it will enable the Indian to endure is something marvelous. It also assists respiration at high altitudes and materially aids in making life pleasant there. The plant was regarded as mysterious and religious, and was placed in the mouths of mummies and about them, so it entered into the life of the people to a great extent, both in utility and ceremony. It was a great gift to the world also, for the alkaloid, cocain, obtained from it, which we employ so much, has been of inestimable service in the alleviation of human suffering.

The deciduous teeth of the Peruvians were well developed, but without any special characteristics that would distinguish them from other races. This is not unusual, as they are always less differentiated than those of the permanent series. But they are strong and well developed, and show from the abrasion on the occlusal surfaces that they were well used. Like all the organs of the immature individual, the deciduous teeth have few features that indicate the differentiation that is so apparent in the structure of the adult individual of the higher organisms.

The Upper Central Incisors.—There are some marked differences to be noted between the tribes of the coast and those of the plateau, in regard to the characteristics of the central incisors. The bandaged, elongated-headed people of the Titicaca region especially, who were largely Aymara stock, were larger and coarser in structure and the teeth and jaws partook of these characteristics. Some of the aristocrats, the Inca classes, of Quichua stock, as well as most of the people of the coast with flattened heads, were of smaller frame and finer organization. The Quichua skulls in the plateau region were of finer type and resembled the forms on the coast. These types are very interesting, and especially so by reason of their association with types of people that are so distinct. We find these qualities carried out in regard to many characteristics of the teeth.

Upper centrals were not very numerous as compared with other teeth, as they were more often absent from the skulls, probably owing to the short roots which allowed them to be easily detached

and lost. Then those remaining were often much worn and abraded, usually to one-third or one-half of their length, and the special features obliterated, so that the best specimens for study were found in young individuals, and especially when in the crypts and not yet erupted.

On the coast, as in the huacas of Ancon and Pachacamac, where the people were small and of delicate structure generally, we find some marked peculiarities of the upper centrals. They were medium to small in size, and of a general form in that the lower half of the crown was wide and parallel, and from there the crown

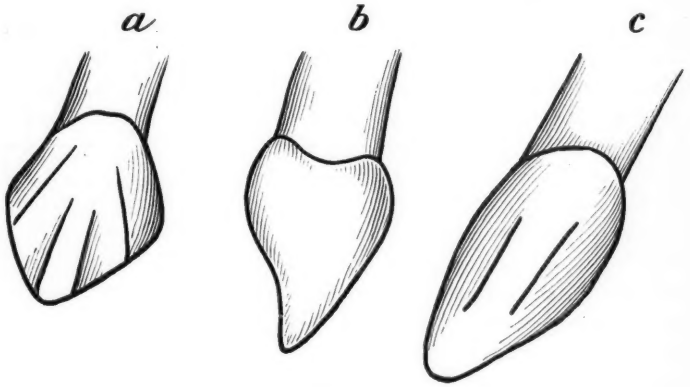


FIG. 5.

Upper cuspids. *a*. Spear-shaped crown. *b*. Mesial view. *c*. Conical form.

tapered rapidly to a narrow neck. This form seems to be associated with the coast people, with fronto-occipital flattening of the head. The marginal and median ridges were not marked on the labial face. Transverse ridges were not uncommon, but as these were probably due to pathological causes, they are outside of our studies just now. The sulcus on the lingual face was well marked, with well defined marginal ridges. Cingules were very rare with these people.

With the coarse people of the plateau, of evident Aymara stock, the centrals were of different form. The main characteristic was, that with a large coarse crown with rounded face there was associated a wide neck that was conspicuous. Sometimes in the coarsest

specimens there were strong ridges, both marginal and median, on the labial face. These features are distinctly low and apelike. The ridges on the lingual face were of course strongly marked in the coarse tribes, and the cingule occurred more frequently. The roots of the centrals were usually rather short and stout in the coarse peoples and smaller and longer in the finer tribes. Some abnormally short roots were observed.

The *upper lateral incisors* partake of many of the characteristics of the centrals, especially as between the coarser peoples of the plateau and the finer stock of the coast, i. e., the former have large coarse crowns with wide necks, and the latter have smaller crowns with narrow necks. In the unworn specimens of the laterals the edge is wide and well marked, defective crowns, as with Europeans, being almost unknown among the Peruvians, even with the delicate luxurious classes. No peg-shaped laterals were found at all, which would have been unusual if not impossible among a similar number of Europeans. On the plateau the necks were wide with strong ridges, and on the coast the crowns tapered rapidly to narrow necks and with smooth labial faces. The lingual face was also more smooth on the coast among the finer Quichuas, but with the coarser Aymara peoples of the plateau this face was strongly ridged with a deep sulcus and occasionally a cingule. But even with the latter the cingule was singularly infrequent. Rarely the deformity of the deep groove crossing the basal ridge over onto the neck of the tooth was seen. A few supernumerary laterals were found, but rarely was one totally suppressed, as so often occurs in Europeans. This does occur, however, as has been described by Dr. Dorsey.

The *lower incisors* ranged in size from medium to small, especially on the coast, where they were often quite delicate in form and size. They were usually wide at the edge, especially the laterals, which had rounded distal corners when unworn. Rarely there was uniformity of width of the centrals and laterals. The necks were usually very narrow and delicate, especially in the finer Quichua types. Occasionally these teeth were very large, especially among the course types of the plateau, and in these the uniformity of size was quite apparent. Excessive wear had been very destructive of these small teeth, so that very few even of the few lower incisors remaining presented unabraded edges. The primitive edge was found in young individuals, or in the rather numerous cases

where irregularity of these teeth had removed them from the area of mastication or use. In such cases the edges were serrated as in the common type of these teeth in children.

The *upper cuspids* remaining are more numerous than the incisors, but present a larger proportion of excessively worn and fractured crowns. Having to bear the brunt of hard usage on account of their strength, the effects are only too apparent. It was rare to find an adult skull in which the cuspids were not worn off one-half or more, or much fractured. Of course this fact prevented the study

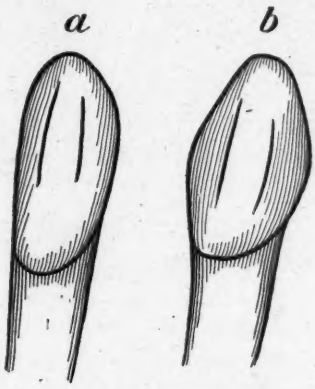


FIG. 6.

Lower cuspids. *a*. Ordinary conical form. *b*. Spear-shaped form.

of their main features except in young individuals. Too often only the general outlines could be made out.

The cuspids presented more variety as to form and size than the incisors. In general they were large and spear-shaped (i. e., the labial outline was like a spear head), with ridges more or less strongly marked on both labial and lingual faces. The labial face was usually full and round, especially towards the cervical border, and the mesial and distal angles were full and either sharp or round. This general form was apparent even when the crowns were worn away one-half or two-thirds, as was too often the case. In the older specimens the labial and lingual faces were worn smooth and rounded. Only in the young were the ridges apparent. The roots

were large, long and deeply implanted, some crowns being one and a half inches long, and the eminence was well marked. In the coarser types they stood out strongly at the angles of the arch, making the characteristic squareness, but in more delicate skulls they were reduced, being small and depressed, and the arch was more rounded. In children especially, when the crowns were still in the bony crypts, the point was small and acute, showing a long and sharp type that is rather low. This was especially the case in the more conical types of the crown which occurred on the coast and among the Quichua tribes. In these finer types the cuspid was longer and more narrow, in conformity to the type of the teeth in general. This long conical cuspid is characteristic of many low races and of some of the quadrumana. Sometimes the bulge of the labial face was absent, as if worn away, and the surface was quite flat. This was found more among the coarse types of the plateau, the full face being found more in the conical types. Transverse grooves were present on some crowns, but these were evidently pathological or were the result of the corrosive action of the coca-lime mixture that was chewed so much.

The *lower cuspids* do not present many distinguishing features. Like the most of the other teeth there are some differences between the coast or Quichua people and the plateau or coarse stock. In general these teeth are large and conical, but on the plateau they are larger, with a tendency to flattening of the labial face and spreading of the mesial and distal faces so as to approach the spear form of this face of the upper cuspids. On the coast they are more conical, with the labial face full and rounded, the mesial face flat and perpendicular, as in Europeans, and with more or less fullness of the distal face in the well known form. In the coarse form of the plateau there are often, in unworn teeth, conspicuous ridges on the labial face, at the marginal edges and in the middle. The lingual face has strong ridges also in this class, but rarely or never a cingule. In worn teeth these ridges are of course obliterated and both faces of the crown become smooth, especially in the more conical cuspids of the finer coast people. With the latter both faces are more smooth than those of the plateau, at any rate. As these teeth were exposed like the upper cuspids to hard usage, they likewise became the victims of destructive abrasion, so that in all adult skulls they were much abraded and in aged subjects were worn to the neck. This fact

interfered with the study of their microscopic features except in young or unworn specimens.

The *upper bicuspids* in all of the Peruvians, except a very few skulls of very low and coarse type, were comparatively small—even more so than among Europeans—as compared with the other teeth in the same denture. This is in accordance with the idea of degradation due to defective structure consequent upon civilization. Both on the plateau and on the coast, among the coarse and finer types alike, the general form of these teeth is with the crown flaring on the buccal face, i. e., is much wider at the marginal ridges than at the neck. This form is modified in old skulls in which the teeth are much worn by the interstitial wear, when the proximate faces become

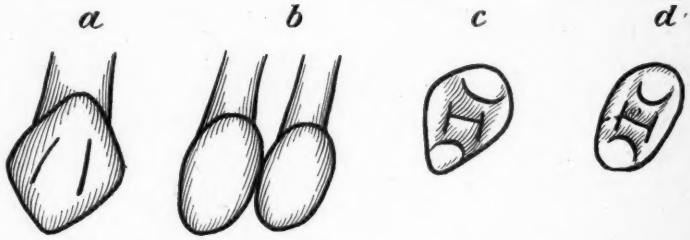


FIG. 7.

Upper bicuspids. *a*. Flaring form of buccal face. *b*. Oval form. *c*. Occlusal face, showing wide buccal cone and very narrow lingual. *d*. Oval form of occlusal face.

quite flat. There seems to be a perceptible difference between the outlines of the crown of the bicuspids of the long-headed people of the plateau and the flat-headed people of the coast. In the former the buccal cone is quite wide mesio-distally and the lingual cone is much narrower in the same direction. On the coast, however, the two cones are more equal in size and the outline is more flat and less oval than on the plateau. This is only general of course, as exceptions occur among both peoples, as stray individuals of the other tribes may have been among them, but the rule as applied to both is sufficiently uniform to have a value for classification.

The *second bicuspids* were usually smaller and flatter than the first. With all of the features less strongly marked, the contrast was often striking. The excessive wear to which these teeth were subjected had the effect of obliterating the occlusal pattern in most of

the adults and in all of the older skulls. When found in young individuals the cusps were well marked, rounded, and not much ridged or sharp, and very rarely were they high and strong, except in very coarse individuals. As a rule the cusps and ridges were not sharp nor well developed, but decidedly degenerate in type. No cases could be found in which three roots were apparently present, as sometimes occurs in low races as a reversion.

The Lower Bicuspids.—These teeth present so many distinctive features, and are so interesting from the ethnical standpoint, that it will be desirable to go into some detail in their description. The *first lower bicuspid* varies greatly in some of its features, and especially in regard to the lingual cusp or tubercle. This ranges all the way from a full form that is on a level with the buccal cusp, down to the mere tubercle like a cingule on the basal ridge. Between these extremes there are all sorts of variations in regard to the height of this cusp. To distinguish these variations, it will be necessary to classify them in a scheme, something like the following: What we will call the *first* position of the cusp is that shown at a, Fig. 8, where the lingual cusp is on a level with the buccal, and together they form the full bicuspid type of the tooth. The wider marginal ridges make a different-shaped crown, but still this type of the full lingual cusp makes a bicuspid crown. The next is the *second* position of the cusp, when it is about ⅛ inch below the first (as at b). This is the type of most frequent occurrence in the Peruvians and also in Europeans and other civilized peoples. The *third* position is that between the second and the fourth (as at c). The *fourth* position is the lowest (as at d). This is the lowest type of the crown, when it seems to be a mere cuspid with a cingule upon its lingual face, which is indeed the form of this tooth in the lemurs and the insectivora. By this classification, after making a tabulated arrangement of the percentages, the following averages were found among the Peruvians, taking all together: Five per cent had the lingual cusp in the first position and were of full bicuspid form; sixty per cent had it in the second position; thirty per cent in the third position, and five per cent in the fourth, i. e., a mere cingule on the basal ridge. Of course there were some differences between the coarse tribes of the plateau and the finer stock of the coast, as with the other teeth, but this was not followed out.

Of other features, it was observed that the first bicuspids below

were of larger size among the plateau tribes and smaller with the people of the coast. One general feature was the full bulge of the buccal face, which was well marked. Then also, the very wide marginal ridges usually exaggerating the well known bell-shape of the crown. Nearly all of these teeth are described as "flaring" in my notes.

Among the coast tribes there often occurs a form of the lingual cusp, mostly when it is in the third position, which is a peculiar feature. This is a prolongation of the lingual ridge disto-lingually so as to appear as a shelf or talon. This peculiarity was found in a number of cases. Sometimes the entire crown was also distorted to

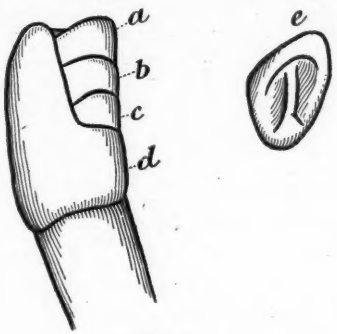


FIG. 8.

First lower bicuspid. *a*. First position of lingual cusp. *b*. Second position. *c*. Third position. *d*. Fourth position. *e*. Occlusal face, showing peculiar form of disto-lingual projection.

form a partial diamond-shape, although this talon occurred also when the crown was full and round. This is interesting as a unique and unusual feature, but it is without any ethnic significance that could be observed.

Among the coast tribes there is often a conical form of this tooth that is associated nearly always with the cusp in the third position or as a cingule. This is a low type, as it simulates the cuspid which, as observed before, recalls the form of this tooth in the lemurs and the insectivora.

Wear of course obliterated the lingual cusp when in the first position, and sometimes in the second, but unless it was very excessive the third position was not approached, hence a diagnosis could be

made in most of the first bicuspids. The indications of the height of the cusp remained fairly well, even when the wear had been considerable. The transverse ridge was usually quite complete across the face of the crown. It was divided by a groove, of course, when the cusp was in the first position and sometimes in the second, but rarely in the third or fourth. But the ridge was always strong, whether divided or not.

The Second Lower Bicuspid.—The crown is of the typical bell-shape in most of the Peruvians; in all of my notes it is described as "flaring." Some are bulged on the buccal face, but as a rule not so much as the first. Indeed, the full or rounded buccal face occurs only on the very large, coarse specimens, as with the Aymara type of the plateau. Both the coarse and finer types seem to flare very much. The simple conical type is very rare and found only in the Quichuas, when the tooth approaches the first in type, with the lingual cusp in the fourth position or the cingule.

The most remarkable feature about the second lower bicuspid in the Peruvians is the almost total absence of the tricuspid form of the occlusal face, which we usually associate with civilization and elaborate though degenerate structure. It is the type of high evolution as well as of degraded structure. The ethnic significance of the tricuspid second lower bicuspid is very interesting, but "that is another story." Suffice it to say that it is rarely found in peoples of low culture and coarse structure, but is usually present in higher peoples, as the Europeans. In low peoples this tooth is not developed beyond the type of the first bicuspid, but unlike the first, it is more differentiated in the higher races and usually presents three cusps. It is more or less of an accompaniment of civilization. So that it was with some surprise that the absence of the three cusps was observed in the Peruvians, as some of them were highly civilized and of fine and degenerate structure. Instead of the tricuspid type, the occlusal face presented the transverse ridge usual to the first bicuspid, or next in frequency, a large crescent occupying the lingual border, but undivided by the usual groove into two cusps. A tabulated arrangement of the different types gave the following results: Fifty per cent had the strongly marked transverse ridge similar to the first bicuspid, but with the lingual cusp or crescent on the level of the buccal cusp; twenty-five per cent had the well marked crescent on the lingual border, but without the transverse

ridge; ten per cent were like the first bicuspid, with the lingual cusp depressed to the third or fourth position; ten per cent were of full bicuspid type, and but five per cent were of the elevated tricuspid type. This is a remarkable showing and indicates the low stage of this tooth among the Peruvians. It shows also that some surprising things can happen in the pursuit of this study, as in other fields of which we know but little. We will need further data before we can decide definitely in regard to this feature, as well as many others in this new science.

The Molars.—The study of the molar series opens up many interesting questions and brings us face to face with some great biological problems. The path of the evolution of the human molars is so well marked out, and they bear in their forms and features so

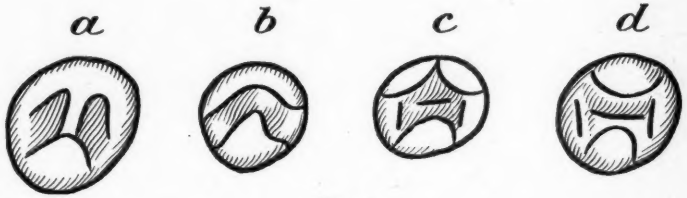


FIG. 9.

Second lower bicuspid—occlusal face. *a*. Transverse ridge form, like first bicuspid. *b*. Crescent form of lingual cusp. *c*. Tricuspid form. *d*. Bicuspid form.

much of the history of their phylogeny, that they serve to illustrate, as few other organs do, the history of the wonderful processes of organic evolution. We find ourselves in the presence of the stupendous workings of the Master Genius of nature, and guided by the light the phylogeny of the molars furnish, we begin to see more clearly the way of a possible solution of questions that affect the destiny of the race, but again "that is another story."

The *upper first molar* in most human races is usually larger, stronger and more constant in the type of its cusps, than any of the other upper molars. We are accustomed to observing this in our practice among Europeans, in whom it is very constant. It presents fewer variations and has less tendency to degeneracy of type. So in our observations of this tooth among the ancient Peruvians it was with some surprise that we found considerable variation and degeneracy of its elements. It was most constant to what

we consider the normal type among the coarser peoples and most variable among the finer stock, the Quichuas, in whom there was a surprising and unexpected degeneracy. We found first that the ordinary square type of the crown was far from common, and that it often had the diamond or trapezoidal form. These departures from the normal type were caused by the reduction of the different cones of the crown. For instance, the diamond-shape would be produced by the depression of the paracone and the hypocone, the protocone and metacone being as large or larger than usual. The trapezoid would be caused, as usually happened, by the depression of two cones in a pair, as the protocone and paracone, so that the mesial half would be less in size than the distal. Then the distal cones would be depressed, making that half smaller. This kind of deficiency of form was quite common. Sometimes the hypocone alone was reduced as in the second molar. Rarely it was totally suppressed and made a tricuspid crown. The number of these deficient first upper molars was so great as to be impressive, but they were found most largely, as before remarked, among the finer tribes.

The usual worn condition of the teeth in adults of course obliterated the finer features of the occlusal surface, so it was only in young subjects or in accidentally unworn molars that these could be made out. In these it was found that, except in the very coarse subjects, of course, the cusps were not high and sharp, but usually low and rounded, with few grooves and ridges. A few were quite wrinkled, which is a low quadrumanous type and not common in the first molars, although it is in the third. A wrinkled occlusal face indicates a declining evolution and reversion to a low type.

The fifth cusp, or hypoconule, on the lingual face was very uncommon. This supernumerary cingule is very erratic, being found in low and high races, seeming to be both a reversion and a higher evolution. Only one or two were found in several hundred skulls. We cannot yet guess what this surprising absence signifies. This is one of the many problems that we will pass on unsolved to our successors.

A conspicuous lingual groove was found on most of the first upper molars. This groove divides the two lingual lobes of the crown, and in some races, especially the lower, runs on over the neck and onto the lingual root. This was a very conspicuous fea-

ture among all Peruvians, both coarse and fine stock, and is a low characteristic, for it is a remembrance of the time when the root was divided into two fangs. It is not common in Europeans nor in any high races, but is present in most low peoples.

The crowns were usually "flaring" in form, that is, more or less bell-shape, except when worn flat on their proximate faces by interstitial wear in old subjects. The type of molar with thick neck, which occurs among Europeans, seemed to be of rare occurrence in the Peruvians.

The *second upper molar* of course presented more eccentricities

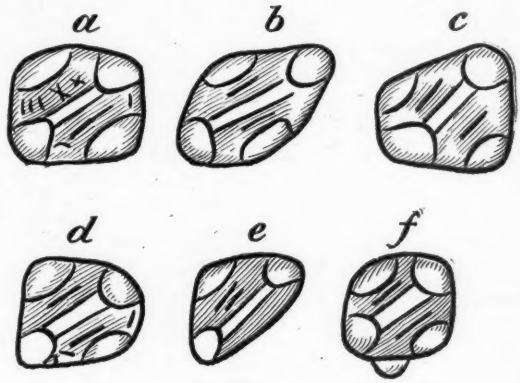


FIG. 10.

First upper molar—occlusal face. *a.* Usual square, normal form. *b.* Diamond form, paracone and hypocone reduced. *c.* Trapezoidal form, paracone and protocone reduced. *d.* Trapezoidal form, metacone and hypocone reduced. *e.* Triangular form, hypocone entirely absent. *f.* Fifth cusp, hypoconule, added to protocone lobe.

of form than the first, as it is always more variable, especially in regard to the hypocone. In Europeans this element is nearly always much reduced, and is entirely absent in a number of cases as we meet them in practice. This was found to be the condition also with the Peruvians, as was to be expected, so there is not much to be presented that is very different. The coarse plateau tribes and the refined coast people exhibited little difference, so the percentages are taken together. In the former we would have expected a larger number of full, square second molars, as is common with coarse

peoples, but such was not the case, the percentage with them being about the same. The general percentages of all together were as follows: Square like the first molar, the hypocone good, fifteen per cent; of trapezoid form, the hypocone reduced but not absent, forty-five per cent; of tritubercular form, the hypocone entirely absent, twenty-five per cent; metacone also reduced, six per cent; diamond-shape and other deformities constituted the remainder. This list of averages reads very much like that of an equal number of Europeans, with quite as large a number of tritubercular and trapezoid crowns of triangular shape. Prof. Cope said years ago that this was a lemurine feature, and the reversal to that type was indicative of great degeneracy. The tritubercular molar is found away back in early geological times, even before the first appearance of the quadritubercular crown in Eocene times.

There are not many features of the upper second molar which are variable that do not depend on the presence or absence of the hypocone. The general conformation of the crown depends almost entirely upon its stage of development. Very often the metacone is reduced also, which contributes to the formation of the trapezoid. Occasionally the protocone is reduced and the hypocone enlarged, which produces the diamond form. The two distal cones are always depressed below the ordinary plane of the mesial tubercles, which is normal, but aside from this the deficiency or enlargement of the crown of this tooth is very erratic in the Peruvians. The lingual groove was not very common, except in some of the square crowns, which simulated the first molars in other respects also.

The roots of the second molar were of the three-fanged type apparently, especially in the square crowns like the first molars. In some sockets there was only a rough connate alveolus like that of the conical third molar, and often the two buccal roots were fused or the lingual and buccal would be fused, just as in Europeans.

The *lower first molars* were of great uniformity, of the usual trapezoid outline, with little variation except in size. They were very large in the plateau tribes and smaller in the others. They were more constant in form than the first upper molars and presented fewer aberrations from the usual normal type. The crowns were very flaring, of full bell-shape, spreading widely at the marginal ridge. In some coarse subjects they seemed to be of the oblong outline common to the apes and low races, but this low type was not

usual. The variability of the prolongation in the rear depended largely on the position of the fifth tubercle, the hypoconulid, as to whether it was on the buccal margin or was swung round to the rear. When in the latter position the crown was more projecting in the rear.

A typical low feature was the wide sulcus on the occlusal face, the usual triangular ridge not being pronounced. This is characteristic of the lower molars of the quadrumana, which are all alike. The triangular ridges appear later in the higher forms of the anthropoids.

Sometimes the buccal or lingual marginal ridges were cut by cross grooves, making supplemental tubercles. This variation would make six tubercles on this tooth. This peculiarity was noticed on young subjects where these teeth were unworn, and especially when

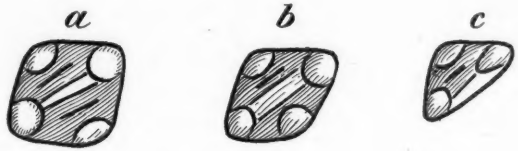


FIG. 11.

Upper second molar—occlusal face. *a*. Square form, like first. *b*. Hypocone reduced. *c*. Triangular form, hypocone entirely absent.

not quite erupted. It was a curious reversion to the multitubercular form of the lower molars. It has occurred in other races and so has no ethnic significance.

The first lower molar was frequently the subject of destructive wear, so that the finer features were often obliterated, and the wide, worn surface presented the well-known, smooth, polished appearance with which we are so familiar in tobacco chewers. Probably it was often due to the same cause, i. e., the keeping and chewing of the "quid" of coca with its gritty ingredients directly over this tooth. There does not seem to have been as much interstitial wear of the lower molars as of the uppers, so that the flaring bell-shape of the crowns was always conspicuous.

The *second lower molar,* like the second upper, is rather eccentric and irregular in form in the Peruvians, quite as it usually appears in the higher races. In the apes and the lower races of mankind it has

the fifth tubercle, the hypoconulid, just like the first, and is in perfect harmony with it both as regards size and shape, but in the higher races, especially the Europeans, it is typically and usually quadritubercular, having lost the hypoconulid in the process of its evolution. This is a degenerate type, but the writer has elaborated that elsewhere. (See paper on "The Phylogeny of the Fifth Tubercle of the Second Lower Molar of Man," Trans. of the International Dental Congress, Paris, 1900.) The ethnic significance of this tubercle still remains to be worked out, and taken throughout all races, it would form an interesting topic for study.

Among the ancient Peruvians the degeneracy of the second lower molar was not so marked as was expected, considering the advance the people had made in culture and their consequent general degeneracy. It was found by carefully tabulated estimate that of the whole number examined seventy per cent had the fifth tubercle like the first molar; twenty-five per cent had only four tubercles, the hypoconulid being absent, and the remainder were irregular, partial fifth tubercle, etc. Destructive wear obliterated the features in some, of course. The result of the percentages arrived at was rather surprising, considering the cultural stage of the Peruvians. Of course the most molars with five were found among the coarse people, but were not confined to them by any means. The coast people, especially at Pachacamac and Ancon, had also a larger proportion of five tubercles than of the quadritubercular form. The results would show that this tooth among the ancient Peruvians of all classes had not evolved as far on the road to degeneracy as with Europeans. The significance of the fifth tubercle is of considerable importance in estimating the cultural stage of a people, and if judged by that the position of the Peruvians is still quite low.

The shape of the crown varies with the presence or absence of the fifth tubercle. When present of course the hypoconulid causes a distinct projection of the marginal ridge in the rear, but when absent the crown has a more square form and perpendicular sides, as we observe in Europeans.

In the quinquetubercular form the sulcus is usually quite wide, like the first molar, the triangular ridges being low; but with four tubercles there was the usual cruciform type of surface, the triangular ridges being well developed.

The roots bore some relation to the presence or absence of the

fifth tubercle, so far as could be observed. In the quinquetubercular form they were wide and well apart, as in the first molar, but in the quadritubercular type they were more connate and closer together.

The *third molars* are more or less erratic in all races, so there is not much ethnic significance to be attached to their irregular variations. In general they are more perfectly developed and nearer the typical form of the other molars in the lower races than in the higher. In the latter they are usually very erratic and degenerate in form and structure, but beyond this we can say but little, as no special value can be placed upon their variations. Indeed, these teeth begin to be deficient in size as compared with the other molars in the chimpanzee, but that also "is another story."

In the Peruvians we found great variation and deformity of the *upper third molar,* quite as much as among a similar number of

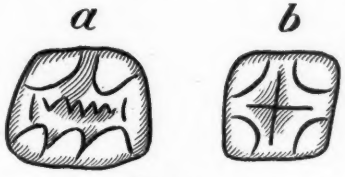


FIG. 12.

Lower second molar—occlusal face. *a.* Five cusped form of normal first molar, found (as ancestral type) as a reversion in second molar. *b.* Degenerate but usual form of quadri-cuspid type of lower second molar in higher races.

Europeans. Of the number examined it was found that only six per cent were of full form like the other molars; forty per cent were tritubercular in form, large and small; fifteen per cent were trapezoid, with four tubercles more or less irregular; ten per cent were of bicuspid form; ten per cent were totally suppressed, etc. So that the irregularity was very conspicuous and with little value as regards the ethnic significance of the variations. We can only say that they were very degenerate and indicated an advanced stage on the path toward suppression.

The *lower third molars* were generally larger than the uppers and somewhat better developed. They were not so regular in eruption, however, as they presented more cases of diverted direction and impaction. Of the number examined, five per cent were irregular in eruption and impacted, most being tipped against the second

molars—some above and below were directed outward, and but very few to the inside; five per cent were totally suppressed, and of these some probably yet remained in the jaw; sixty-five per cent were full size, with four or five tubercles like the other molars; twenty per cent were small, with four tubercles or irregular; five per cent had the wrinkled occlusal face sometimes found, which is a reversion to the form of these teeth in the orang. A small proportion had abnormally large crowns, as if an attempt to produce the fourth molar had been made and the abortion was fused to the third molar, as is sometimes distinctly observed. Altogether the lower third molars were better developed, but yet were very erratic and irregular, like those of the higher races.

In conclusion, I will offer nothing in the way of a summary, for this study has been only in the way of an experiment, with the purpose of assisting in discovering characteristics that might possibly be considered ethnic. For this purpose, however, we have not yet sufficient data and cannot have without much more extensive observations, so my work must be considered as suggestive merely and as an effort to blaze the way for more elaborate studies and investigations. My mission will have been accomplished if I shall have interested students in the subject of ethnographic odontography sufficiently to induce one here and there to take up and pursue the work among different races. Years of study and masses of material will be required before we can safely venture upon definite generalizations and deductions. I can only hope that this imperfect contribution to the great subject will stimulate the study and gathering of that material.

Discussion. *Dr. C. N. Peirce,* Philadelphia: I have been with Dr. Thompson in the study of the crania and teeth, and know the close attention he has given to the subject and the immense amount of work involved in preparing this paper. It requires much care and ability to discriminate between and fully appreciate the modifications that are taking place in the different races with regard to the teeth. I was especially interested in these particular researches of Dr. Thompson's, because after going over the crania to which I had access in the study of the third molar of the Peruvians I was surprised to find so large a proportion of these molars that were so much reduced in size. Not until after I had made this examination, and then attempted to learn something of the history of the Peru-

vians, did I see what I thought was the reason for the change that had taken place in these teeth. The Peruvians have been civilized for many generations, and their food, besides being cooked, has been vegetables and fruit. I have always maintained that a vegetable and fruit diet has a marked influence in the modification of the size of the third molars, simply because less force is required in mastication. There is also greater development of the lower jaw when the tribe has lived on raw food. You will remember I stated in my paper that I found more than one-half of the third molars reduced in size, which surprised me greatly, and it was not until I had obtained the history of these people that I could see why it should be. The fact was fully explained by their civilization and food habits. For many years I have held the theory that the food habit is instrumental in modifying not only the size and prominence of the lower jaw, but also the size of the teeth. The force exercised by the muscles in mastication has a greater influence than you imagine on the molar processes as well as on the maxillary bones.

Dr. Cox: I wish simply to add one more link to this chain in regard to the Indians. The Columbia Indians are divided into various tribes, one of which is known as the Flatheads. The shape of the head is similar to that of the Incas, but the form is brought about by binding the child's head to a board, producing a sloping forehead. The number of skulls to be procured is not very great, as it is a small tribe, and almost extinct at the present time, and the habit has practically disappeared, but in those skulls that I have examined I have found, as in the Incas, absolutely no displacement of the teeth on account of the shaping of the head, also that the teeth are uniformly large and sound.

Dr. Brigham: Dr. Thompson spoke of trephining practiced among the Incas and called it a fad, but I believe it was a necessity with them, and that they were practicing what might be termed the high art of brain surgery. They probably found that in some cases the brain was injured by the pressure brought to bear upon it in the changing of the form of the skull, and that it was necessary to practice trephining in order to relieve the brain of that pressure. This would be my explanation why so many examples of trephining are found.

Dr. Thompson, closing discussion: This practice of trephining among the Peruvians is very interesting. Squier in his "Travels in

Peru" says he believes that they performed the operation not only for surgical reasons but for pathological conditions. Of course it is a question as to how much they understood about it. Trephining has extended among various savage peoples, and is practiced today by some of the tribes of the Pacific Islands. They perform the operation for very simple lesions, even for the relief of a headache. The shaman will uncover the scalp and scrape a hole in the skull with a seashell. It is something of a fad among them as a treatment for almost all kinds of diseases and disturbances. There are other matters of interest about trephining which I could not elaborate in the paper. Trephining was practiced considerably among savage tribes on dead bodies in order to secure amulets or rondells, little round pieces which were worn as charms. There is also no doubt that living victims, as prisoners, were subjected to this operation.

When reading the paper I did not have time to speak in regard to other facts which were outside its scope. I did say, however, that in my recent studies I had noticed the exceedingly small size of the bicuspids among the Mexicans, and that so far I have found the same thing true of other American tribes. This fact would seem to militate against what is called the Mongolian theory of the origin of the American races, because the bicuspids among the Mongolian tribes, and especially among the Chinese, are exceedingly large in comparison with the other teeth. There are many other things that could be brought out, but I do not want to make any generalizations or deductions as yet, because we are in want of reliable data. The microscopic anatomy of the teeth should arouse our interest, and I hope that dentists in this and foreign countries will study the subject in relation to peoples with whom they may come in contact.

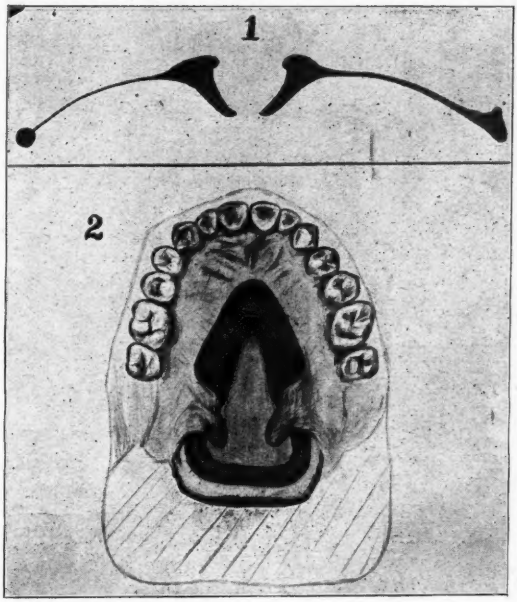
NEW ARTIFICIAL PALATE.

BY CALVIN S. CASE, M. D., D.D.S., CHICAGO. READ BEFORE THE NATIONAL DENTAL ASSOCIATION, AT NIAGARA FALLS, JULY 28-31, 1902.

The object of this paper is to present a new form of artificial vela for congenital cleft palate. It follows in principle the Kingsley flexible rubber vela, but differs from them in certain important particulars, both in form and construction. Those who are familiar

with Dr. Kingsley's palates, which I am pleased to say I have successfully used in my practice for twenty years, will remember that the veil or posterior portion of the palate is sustained by extending the central thickened portion of the body into the veil, where it is gradually flattened to a comparatively thin edge, that is intended to fit along its border the contracted pharyngeal walls.

In this particular it differs almost diametrically from the palate

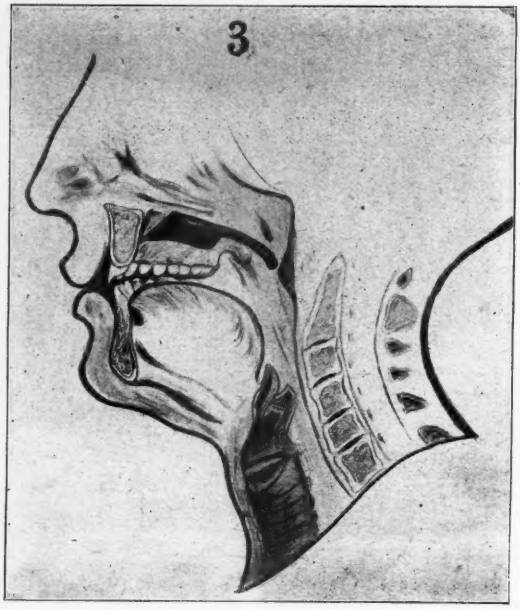


I am about to describe, in that with the latter all the central portion of the veil and body between the borders of the cleft is thin like rubber dam, while the edge of the veil is thick, in the form of a solid roll of rubber, about one-fourth of an inch in diameter, or three-cornered, flaring from the central thin portion, and so placed that its outer flat surface conforms to the plane of the pharyngeal walls. Figure 1 represents transverse sections through the mesial plane; Figs. 2 and 3 show palate in position.

As the roll or border of the veil extends forward on each side

along the lateral walls of the pharynx, it should gradually merge into the body of the palate to form the borders of the artificial floor of the nares.

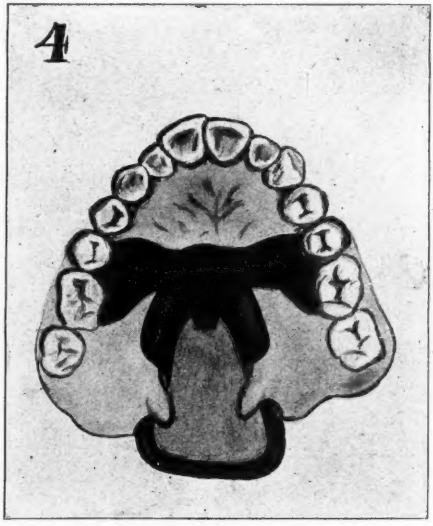
There are a number of advantages in this form of artificial palate: *First.* The early deterioration and curling up of the edge of the veil is prevented. When this occurs, as it frequently does in a few months with vela having thin flexible rubber edges, unless the



borders are greatly thickened, which adds materially to the weight, the vocal usefulness of the palate is impaired, if not destroyed, in proportion as it permits the escape of air at the curled-up portion of the border. *Second.* The roll forming the border of the veil is sufficiently yielding and flexible when properly fitted to be worn with comfort, and it also presents a stability of movement that permits firm contact of the pharyngeal muscles in their efforts to close the naso-pharyngeal opening. *Third.* In more or less extensive clefts the thin central portion extending forward into the body of

the palate permits a resilient yielding of the lateral portion of the body to the contractions of the bifurcated velum palati. This possibility in the movement of the palate often permits springing it into place with sufficient grasp of the nasal borders to sustain it in position without other aid. *Fourth.* The method of fitting and constructing the model of this new palate, as will be described, is one of the principal advantages of its form.

In taking an impression for the construction of this palate it is my

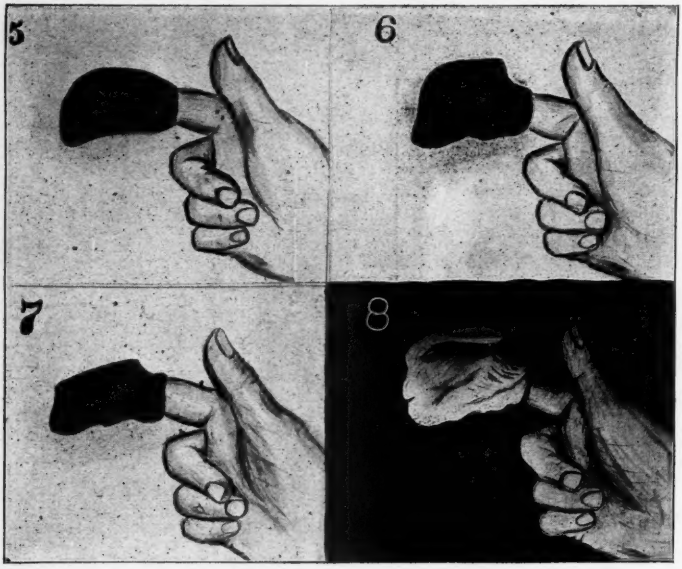


object to obtain a perfect model of that portion of the roof of the mouth over which I wish the palatal portion of the palate to extend, and along the borders of the cleft forward of the pendant portions of the velum palati, extending somewhat upon the floor of the nares and representing as perfectly as possible the lateral surfaces at the posterior nares.

These surfaces, a part of which lies above the pendant and unstable tissues of the bifurcated velum palati, are frequently susceptible of being perfectly reproduced in the model of a plaster impression. It will usually be found in a typical case that the posterior nasal openings are laterally constricted, from which point the nasal

fossæ widen to form the floor of the nares. By obtaining a perfect impression of these somewhat unyielding surfaces, which otherwise, on account of their position, would be very difficult to reproduce, the thick border of the artificial veil can be perfectly fitted to them, as it merges into the body of the palate to form the border of the artificial floor of the nares.

I lay great stress upon this portion of the work, because I have



found that this particular form of palate is not only a great aid to the proper action of the pharyngeal muscles, but that in clefts where the thin central portion can be carried well forward between the lateral wings of the body—as in the two cases the complete models of which I present for your inspection—overhanging nasal borders of considerable extent can be easily sprung into place, and when fitted perfectly patients soon learn to place and sustain the palate without the aid of a supporting plate. I would advise, however, that the supporting plate be made, to enable the patients to more readily adjust and sustain the palate, until they have learned to do without it.

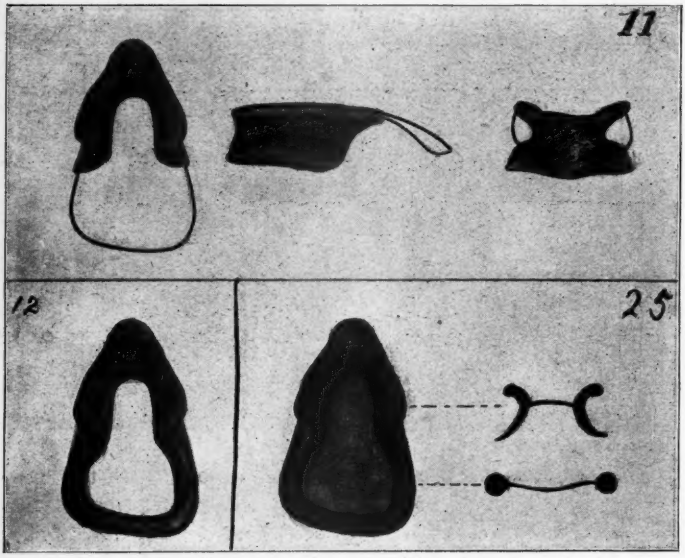
In one of the above cases the palate was made without a supporting plate, and the patient, having worn a palate of a different form, was able to handle and sustain it in position from the start. The four incisors which had been attached to the plate in the first operation were changed to a bridge.

When no artificial teeth are required the supporting plate should be made to cover as small an area of the roof of the mouth as is consistent with the demands for strength. I rarely extend it forward of the second bicuspids, leaving as much of the natural anterior palatal surface exposed as possible, which I believe materially aids in acquiring perfect enunciation.

Fig. 4, which is made from a model of a mouth with the apparatus in place, shows the form of the supporting plate which I usually make.

Preparatory to taking the impression for an artificial palate, I study well the cleft and surrounding surfaces, and then with a piece of modeling compound wrapped around the forefinger (see Fig. 5) I press it gently to place. Removing, softening and slightly reshaping it, I repeat this operation several times, with the view of obtaining a modeling-compound impression that will not displace the soft parts, and that will perfectly support the plaster of the final impression (see Fig. 6). The palatal surface is then roughened, so that the plaster will cling to it, and all that portion of the compound which extends above the borders of the cleft is cut away and the cut surface smoothed and oiled (see Fig. 7).

This, when finally carried to place with the plaster in position, need cause no fear of difficulty in its removal, as all that portion of the plaster which extends above the border of the cleft, forming the impression of the nasal fossæ, will readily break from the smoothed and oiled surface of the compound, and can be rescued by tearing it from its lodgment and allowing it to fall whole or in sections upon a mouth mirror, and is then replaced on the impression (see Fig. 8).



With the plaster model made from this impression, nearly all that portion back of the attachments of the velum palati is cut away, and the nasal borders and lateral surfaces are open and freely exposed (see Fig. 9). This is done to facilitate shaping and ready removal and replacing of the modeling-compound model of the palate during its repeated adjustments to the mouth, in obtaining the desired form of the model of the veil.

The model of the body of the palate, as shown in Fig. 10, is formed first, and then inserted in the mouth for trial. This can usually be accomplished with the hand alone, by passing it back of its proper

position and then bringing it forward. It should be done quickly and easily, or contraction of the muscles will prevent its accomplishment. At this time the lateral nasal extensions of the model should be abridged to facilitate introduction. They can be added at the time of investment and still further extended, as can other parts, by scraping the metal casts.

The surface of the pharyngeal wall in the contracted position of its muscles, which represents the surface that is ultimately to close around and press against the peripheral border of the artificial veil, is obtained with a loop of No. 22 soft copper wire, the free ends of which pass into tubes imbedded in the upper surface of the model, as shown in Fig. 11.

The loop is drawn out and bent to about the proper size and shape, and the model then inserted in the mouth for correction. This is repeated, bending, enlarging or contracting, etc., until the wire is seen to rest along surfaces that are best adapted to unite in their action with the artificial veil for the ultimate closure of the naso-pharyngeal opening.

The posterior line of wire should rest just in front of or slightly above the greatest contracted extension of the superior pharyngeal muscle. (Figs. 2 and 3 show relations of pharyngeal walls to border of veil.) The surrounding muscles can be made to contract by a slight tittillation of the surface, and what is of the greatest advantage—the pharyngeal walls above and below the wire can be readily seen and studied in their action through the open loop.

The action of the muscles alone, springing forward against the pliable wire loop, pressing it back into its sockets, or bending it to fit their surfaces, will frequently cause it to mark the desired peripheral outline of the artificial velum.

As the loop turns forward to pass beneath the openings of the Eustachian tubes, the pharyngeal surfaces will often be found corrugated and thrown into irregular folds, so that in finding the smoother path across these ridges to prevent the escape of air at the border of the veil through the sulci it may be found desirable to raise or lower the wire upon one side more than the other. Forward of this it soon comes in contact with the upper surfaces of the palatal muscles as it enters the posterior nares.

After fitting the wire, to mark the desired outlines of the veil, the roll of compound which is to form the model of the border of the

veil may now be attached to the loop, following the outline of its peripheral surface, and finally adjusted to the mouth to correct imperfections.

Fig. 12 shows different views of a model and completed palate.

Discussion. *Dr. R. Ottolengui,* New York: I had always thought until to-night that it would be necessary for those who treat these cases mechanically to decide between a hard rubber obturator and a soft rubber velum, but Dr. Case has brought us a new appliance. He states that it differs essentially from the Kingsley velum, and it certainly does, not only in form but in action and in every feature. Of course it is not a hard rubber obturator, but I consider it an obturator rather than a velum.

The first feature to which I would call attention brings me back to the very point to which I alluded this afternoon in the discussion of Dr. Brophy's operation, namely, that it is essential—perhaps not in every case, but important as a theory if you are to take up the treatment of this class of cases—in addition to simply supplying an appliance which will make up for the defect in the posterior portion of the palate, to also construct a dome against which the tongue may occlude in making palatal sounds. It seems to me that in this particular respect the anterior part of Dr. Case's apparatus will be found less effectual than the same surface of the Kingsley velum, which is made continuous with the carrying plate and the new curve of the arch which is created. This is not an essential defect, because Dr. Case could undoubtedly readily mold a similar apparatus in which the concavity would be absent.

In the Kingsley upper flap this flap comes down and crosses just at the junction of the split velum. Between the central portion, which connects the upper flap and what we may call the nasal flap with the palatal flap, there is just sufficient rubber to hold the two parts firmly together. They do not come in contact at all with the borders of the cleft, because during speech and deglutition the divided natural soft palate comes together and also droops, and it is the intent of the Kingsley palate to provide a space in which this divided palate shall move. Dr. Case's instrument fits accurately against the border, but in Kingsley's there is a space between that portion which connects it and the border, so that in speech, which brings the two parts together, there is room for the necessary movement. The delicate accuracy which Dr. Case has given to his im-

pression, and his ingenious method of getting it, enables him to fit this portion of his palate very accurately against the borders of the cleft, but he has recognized the necessity of not carrying this down against the soft parts, because he knows they must be allowed to close together. They are commonly so closed that it is practically impossible to take an accurate initial impression of a cleft with any material whatever, because the foreign body immediately causes a contraction of the cleft parts, and however accurate and beautiful the impression and model may appear, the reproduction of the palate is less in width than it naturally is. In other words, if an obturator were made to accurately fit such a model, and were placed in the mouth, the parts at rest would not touch it at all. In a case of the kind for which Dr. Case's instruments have been made it is evident that the cleft has passed into the hard tissues, and the part holding it is also there. This enables him to get this portion of the artificial palate rigid as he has it and leave some play for the soft parts. I would ask him what will happen when he applies an apparatus of this kind to a case where the division is posterior to the hard palate and entirely in the soft tissues.

As regards my statement that this is an obturator and not a soft palate, the Kingsley soft palate enables the tissues to move, and its back end, which is against the pharyngeal wall, is brought to a feather edge, and can often be made long enough to touch. It is usual to leave it short until the patient becomes able to tolerate it and then lengthen it, so that most of the time it comes in contact with it, but being a feather edge, as the palate rises in its attempt to close the upper nares, it is turned up and offers a broad surface. In the Case appliance we have a thickened border at the back and it must consequently be so set that the rising palate will simply come in contact with it. It may be entirely efficient in the cases where the Doctor is at present using it, but there are other cases where he will find it necessary, to completely occlude the nares, in using an instrument of that kind to have the border much wider, as we make it in the hard obturator.

If it is to be an obturator, why should it be made of soft rubber? The soft rubber would not be so durable as the hard, and hard rubber obturators can be made to serve every purpose. The only advantage of a soft velum over an obturator seems to be that it enables a more rapid progress in the acquirement of speech, but

later in life, perhaps at the time when the patient needs a new instrument in any event, speech having been perfected, it is usually preferable to make a hard rubber appliance, which will be permanent and more cleanly than one of soft rubber. Thus the obturator apparently comes with use after the patient has been educated to speak by means of the soft rubber appliance, which should in every sense of the word be a velum. However, in many instances an obturator can be inserted at the outset with very beneficial results.

A cursory examination does not warrant me in condemning Dr. Case's appliance, but I think he has brought something, which, however ingenious, will not be useful as an obturator, being soft instead of hard, and perishable and uncleanly instead of durable and cleanly, nor turn out to be an improvement over the Kingsley velum. Although made of soft rubber I do not think the Case instrument will be at all movable in the mouth, for it is sufficiently rigid to resist the effort of the soft parts to move. I saw this beautifully illustrated in an attempt to make an instrument which should act as a velum though constructed of hard rubber. The movements were to be facilitated by hinges and delicate springs, which should bring the instrument back into place when moved by the soft parts. When held in the hand these appliances would move up and down almost at a breath, but when placed in the mouth in contact with the soft parts they were just as immovable as though there were no springs and hinges at all.

Dr. Thos. Fillebrown, Boston: I understand the matter as Dr. Ottolengui has explained it, namely, that this is an obturator, and that it is in such form as to entirely and at all times shut off the mouth from the nares. The appliance is remarkably ingenious and well done, but if I understand its action right, it is unphysiological, unscientific and unphilosophical. I am aware that Dr. Kingsley said years ago that if the slightest amount of air passed from the mouth behind the velum into the nares you got a nasal twang, and I understand Dr. Case and Dr. Ottolengui to follow in the same line. I think Dr. Kingsley and his followers are mistaken. The fact is, there are only comparatively few cases in speaking or singing when the soft palate is back against the pharyngeal wall. Twenty years ago I commenced to study it in connection with the use of obturators. I soon became convinced that Hemholtz, Seiler, Kingsley and others were in error. I soon found that what was said in regard to

Edward Everett was absolutely true—that the far-reaching quality of his voice was due to the proper proportion of nasal resonance which gave the vocal sounding board its normal value in tone production. The nasal twang is not caused by the passage of the sound through the nose but because the nasal passage is contracted. As I am speaking now I know the sound is going through the nose and the sound of the voice is natural, but if I pinch my nose a little I know it is not going through the nose and it gives the nasal sound so objectionable. If the passage to the nares is closed we lose the resonant power of the ethmoid cells, the sphenoid cells, the frontal sinuses, and the whole upper parts of the head, and any apparatus that is based upon the doctrine that you are to shut off the mouth from the nasal cavities is unscientific because it is unphysiological. There are a few consonants for which you must close the palate, where you must get the force of the air against the teeth, but otherwise not.

Just a word as to articulation. It should not be done in the mouth or in the throat, but with the upper lip. If the velum is held well forward and the words spoken from the lips they will seem to drop off without effort and with great distinctness. The voice will be aided by the articulation and will be full, free and penetrating.

Dr. G. V. I. Brown, Milwaukee: Dr. Case's device was constructed with remarkable ingenuity. Anyone who understands the obstacles to be overcome in dealing with these tissues must realize the great difficulty of making anything like an accurately fitting apparatus such as we have seen tonight. I believe these cases should be operated upon, as there is no doubt that the opening can be closed by operation. I have no use for an obturator. I think the chief difficulty about this will be found to lie in the unusual effort necessary for speech in cleft palate patients who have reached the age of this patient, making these muscles a very uncertain factor. I am sure the power of these muscles and their ability to close such openings is very much greater than people who are not familiar with them realize.

Dr. Grant Molyneaux, Cincinnati: It seems to me that the remarks of Dr. Ottolengui are somewhat contradictory. I should like to know how the Kingsley velum, as he calls it, is more of a velum than the Case velum, which Dr. Ottolengui calls an obturator.

Dr. Ottolengui: I would ask Dr. Molyneaux if he knows what either one is.

Dr. Molyneaux: I know that neither has any physiological action, any more than forming a joint with the living tissue and stopping up the hole. As I understand it, the object in the treatment of cleft palate is to maintain as nearly as possible hearing, vocalization and deglutition, and whether they call the appliance a velum or an obturator, and whether it is composed of soft or hard rubber, that is its purpose. I do not understand the reason for calling Dr. Case's flexible appliance an obturator and Dr. Kingsley's a velum. Neither of them has any anatomical value. They are both inert material, and simply fill in a gap and take the place of something that has been wanting from birth. The misuse of terms is confusing to those who know nothing about the subject and adds difficulty to it. The appliance which has been presented tonight is a beautiful one in many ways. Interesting problems in mechanics have been surmounted, but the problems of physiology and hygiene have been ignored. As to the wire for measuring the pharyngeal cavity, I think Dr. Case will find practically the same thing described in one issue of the Dental Review. In the models shown one part which aids speech has been observed, but other important problems have been entirely ignored. As Dr. Suersen has said, and he is the only man who has contributed anything scientific on this point, the superior constrictor muscle forms a joint with the obturator or velum, whatever the rubber appliance is, and that is the only way it acts. These flexible rubber vela clog up with mucus on the surface and there is no opportunity left for the action of the muscles, the connection of which has been destroyed by this fissure, to remove this mucous accumulation. I deny that the patient is better off by first wearing a velum or soft rubber appliance, and assert that the obturator in the majority of cases is best in the beginning. It presents a hygienic surface against the muscles, and better results are obtained in speaking and swallowing. In every case where the muscles are divided by operation we have progressive deafness, and by the use of a flexible rubber veil you have not deafness but a lack of sensitiveness in hearing.

Dr. Ottolengui: The difference between an obturator and a velum is this—the first recognizes the abnormal condition of the parts, and is so shaped that, with these abnormal parts working against its

sides and end, it makes possible the proper occlusion of the nares in all movements of the palate, so as to produce perfect speech, the obturator itself remaining rigid, and the cleft parts sliding against the lateral sides, these being so shaped that they occlude the cavity when the parts are at rest, and therefore when the cavity is at its widest opening, and they are so slanted that as the parts are drawn together and brought down they slide along the oblique sides of the obturator, continuing the occlusion. The velum is a mechanical effort to reproduce artificially the original soft palate which is missing. It is a flexible bridge across the chasm, and should as nearly as possible act as the original tissue did. Therefore Kingsley arranged his velum so that when it rested the chasm was bridged. The split parts of the artificial velum allowed a resting place for the borders of the cleft soft parts, and the artificial velum was made sufficiently flexible that in any position they might assume in the closing of the aperture they would carry along the velum. The obturator is rigid and immovable and the soft parts move against it, while the velum is flexible and movable, and is carried with every movement of the soft parts. There is just as much difference between them as there is between the fixed bridge and removable plate.

Dr. Molyneaux: I do not think Dr. Ottolengui has explained the point. He says the obturator recognizes abnormal conditions, but it is an inert substance and can only stop the opening. We cannot endow flexible rubber with blood vessels, flesh and nerves.

Dr. Case, closing discussion: I should like to correct an impression that Dr. Fillebrown seems to have in regard to the action of the artificial palate, whether it be an obturator or a velum. He remarks that Dr. Kingsley says—and he seems to think I claim the same thing—that it is made to shut off at all times the naso-pharyngeal opening. That is just what it was never made for by Kingsley or any other man.

Dr. Fillebrown: I did not so state.

Dr. Case: I understood Dr. Fillebrown to say that it was to close the opening, and in closing the opening at all times it produced a nasal twang, and he represented it by closing the nares to show that such was the fact. If the naso-pharyngeal opening were closed at all times or very many times in the formation of speech it would certainly be very unscientific. In natural speech it is necessary to close the naso-pharyngeal opening only when it is desired to produce a

forcible pressure of air through the mouth, or a full stoppage of the air, as in the expression of explosives. If it were not possible to do this at times it would be impossible for us to express the sounds which are known as explosives, such as b, t, g, and all of those consonants whose pronunciation is accomplished in that way; but in the formation of these sounds it is necessary that the pressure shall be immediately removed and the opening again be allowed to exist, in order to produce the resonance of the other tones that is desirable. I do not think that any man who knows anything about the subject ever attempts, in the construction of an artificial palate or an obturator, to make an instrument that will completely close the nasopharyngeal opening when the muscles are in a normal or pendant condition, but he endeavors to make an appliance that will act in conjunction with the surrounding muscles, which the patient comes in time to work almost involuntarily, the muscles so acting that they will gather in and around the artificial palate to close the opening at will. If this be not accomplished the work is a failure. In the construction of this particular instrument I have endeavored to show how the veil can be made to fit the pharyngeal walls when they are extended forward. It is by repeated trials of the models of the palate, and finally of the palate itself, that we arrive at an instrument which will enable the patient to close at will the nasopharyngeal opening, and my object in introducing this form of palate is to obviate a difficulty that I have found in the use of the Kingsley, namely, the border of the veil is so thin that in a short time it curls up and becomes useless. By thickening the border of this veil, without giving it weight or without making it unusually stiff and rigid, a great improvement is effected. At one time I presented six patients before the Chicago Dental Society, and not only could they all speak well, but some could enunciate as perfectly as if they had no cleft palate. The result was accomplished only by the fact that they were able to work the muscles in unison with the artificial palate. I would not necessarily confine myself to this one new palate for all characters of cleft, as I would use one of hard rubber where it seemed to be called for, and in the clefts that Dr. Ottolengui refers to, which do not extend into the hard parts at all, it would be impossible to produce good results with the same kind style of appliance that could be used in other cases.

Digests.

LORENZ OPERATION.—This bloodless method of reduction in the treatment of congenital dislocations at the hip may be described briefly as follows: The thigh is strongly abducted and the adductor muscles are torn from their attachment by chopping or sawing with the edge of the hand. This must be complete, as this group of muscles prevents the superabduction so necessary to keep the limb in place after it has once been reduced. After the muscles are torn through, the limb is stretched to pull the head down to the level of the acetabulum. When this is reached, the thigh is flexed and extended vertically upward, at the same time making pressure behind upon the trochanter so as to force the head forward. Then, still keeping the hand or wedge beneath the trochanter to act as a fulcrum, the leg is abducted and the head slips over the posterior rim of the acetabulum with a distinct snap. The head is now in the acetabulum, but has no tendency to stay there, and becomes redislocated as soon as one attempts to straighten the limb. To overcome this, the hip is reduced and redislocated several times, the joint is rotated and pressed in so as to bore out the acetabulum. In cases of greater difficulty Lorenz attempts the reduction over the upper rim, which consists of making traction upon the thigh by means of a skein of yarn slung about the leg and pulled rhythmically by several assistants. The use of the screw for this purpose has been given up on account of the danger of fracture. The leg must be rotated inward to guide it to the acetabulum, while counter-traction is made by means of a perineal band. The physical signs accompanying a successful reduction are easily demonstrated and cannot be missed. The leg becomes as long as its normal companion; the hollow Scarpa's triangle becomes filled up, and the head can be palpated beneath the femoral muscles. The knee becomes flexed from shortening of the hamstring muscles. The snap, which is felt and heard at each reduction of the joint, can often be made out by observers several feet away. Upon redislocation all the above signs disappear. The second step in the operation is to turn to use what has been gained in reducing the head. As already mentioned, the head slips into the acetabulum only after extreme abduction, combined with flexion and internal rotation, has been attained. Any lessening of this extreme position allows the thigh to become redislocated.

Therefore Lorenz fixes the limb by means of a plaster cast in this extreme position, and after the first few days of pain and restlessness pass away the flexed limb is fitted with a high shoe so as to enable the child to bear its weight upon it. In this manner the child is encouraged or rather forced to run about all day on this limb, so as to allow of the functional burdening of the head and acetabulum. This pressure soon digs out a new joint, which is easily demonstrable by means of the X-ray. Crutches are never to be used, for they defeat this purpose. After six months the cast is removed, the leg brought nearer to the horizontal and a new cast applied. Finally, after eight to twelve months, the cast is taken off altogether, and a high shoe is placed on the sound leg to preserve a small amount of abduction; this, with massage, electricity, and gymnastics.—*Medical News.*

PLATE EMBEDDED IN ESOPHAGUS REMOVED BY EXTERNAL ESOPHAGOTOMY. Dr. A. T. Bristow of Brooklyn reports (*Brooklyn Med. Jour.*) a case admitted to the Bushwick Central Hospital. It appears that at 6 a. m., while eating a roll at breakfast and intently reading the paper, the patient swallowed what she thought was a large piece of crust of the roll, but upon her tongue touching the roof of her mouth she missed the center of the plate of false teeth, the teeth remaining in their proper position on the gums. About 10 a. m. she was advised to eat some potatoes and oatmeal, but upon trying to swallow she was forced to retch and vomit the food. During the afternoon she attempted to swallow some beef-tea, but it was rejected in the same manner. The doctor called advised removal to the hospital. An anesthetic was administered and an unsuccessful attempt was made to remove the plate by the mouth. Dr. Bristow saw her in consultation the following day, and on passing a probang found the obstruction to be about the distance of the cricoid cartilage from the teeth, and advised immediate external esophagotomy. He made an incision from the superior border of the larynx to the clavicle, and careful dissection very soon revealed the esophagus; the recurrent laryngeal nerve was observed and pulled out of the way, also the inferior thyroid artery. The operation was somewhat complicated, owing to the fact that there was an enlarged lobe of the thyroid gland which obstructed the field. That was partially released by a little dissection and pulled out of the way, when the dental plate was readily dis-

cerned by palpation even below the cricoid cartilage. A relatively small longitudinal incision in the esophagus was made and the plate extracted through an incision perhaps not over an inch long.

An interesting fact connected with the repair of the esophagus was that no attempt was made to suture the mucous membrane. The books usually advise that there shall be a suture of the mucous membrane and a separate suture of the muscular coats of the esophagus. He contented himself with passing square mattress sutures at some distance beyond the cut in the esophagus, on each side, not down to the mucosa, but simply bringing the muscular walls together very much as one would the intestine. This was done with No. 1 catgut. The stitches were placed close together and drawn securely, but not so tight as to strangulate the tissue. The wound

was then closed with the exception of the lower end, into which was introduced a small drain of gauze. The woman's head and neck were then firmly fixed with plaster of Paris so it was impossible to move the head in any direction, and no nourishment, drink or otherwise, was allowed by the mouth at all, the idea being to put the esophagus in a condition of absolute rest. Sufficient morphin was ordered to prevent any reflexes of the constrictors of the pharynx. The patient was fed for over a week entirely by the rectum and nothing whatsoever was given by the stomach. She stood this well. At no time was there the slightest leakage from the esophagus. At the end of three days the gauze drain was removed, no leakage having occurred. At the end of a week the patient was allowed to swallow a little water, and as there was still no leakage apparent she was put on soft food. This diet was continued until two weeks had elapsed, when she received ordinary diet. The patient made a complete recovery, and the temperature chart

showed the really uneventful character of her convalescence. The temperature at no time reached 100°. This piece of rubber plate lay in the esophagus in such a manner that it acted exactly as the war arrow of the Indians would—that is, the moment the esophageal forceps caught hold of the plate and traction was made, the two sharp points of the plate embedded themselves in the esophagus, so it was impossible to remove it in that way.

CHEMIC PATHOLOGY OF THE SALIVA AND PHARYNGEAL SECRETIONS (SIALO-SEMEIOLOGY) AS A MEANS OF DIAGNOSIS. By D. B. Kyle, M. D., Philadelphia. (*American Medicine.*) In the course of my laboratory investigation I have often been impressed with the importance of the chemic changes which occur in various secretions, especially the saliva and the tissues of the body. Very little is known about the chemistry of what we call normal saliva, and when we add to this pathologic materials and altered chemistry it is easily understood why so little is definitely known on the subject; especially as the field for investigation is so extensive and involves the application of organic chemistry. It is a well-known clinical and laboratory fact that a study of the products of the secreting organs, which in their excretory functions throw off waste material, gives us by deduction a fair idea of what process is going on within the body. Yet this excretory secretion of material is altered in its chemic composition and controlled by the chemic constituents within the body proper. There is no question that under certain conditions, as for example, when the secretions are acid or alkaline, the chemic process taking place within the various secretory glands must vary, and the product of such variation in these unknown quantities must be somewhat the same as the variations we would obtain in dealing in the laboratory with known compounds—in other words, that the body is largely a chemic laboratory, having on hand a certain amount of material, and having added to it daily other ingredients through the respiratory and alimentary tract. Now, any perverted condition from what is known as the normal chemistry may bring about a series of changes and produce chemic products which may be harmless or productive of disease processes. On no other basis can we explain the various diatheses and the precipitation of certain materials in the tissues of the body—for example, why uric acid should

be formed and precipitated in so many and varied forms in certain individuals, while others are absolutely free from such chemic compounds.

That cell nutrition depends upon the chemistry of its supply is illustrated in disease processes associated with any form of infection or rise in temperature. This opens up an enormous field for speculation and investigation. The amount of infection, the peculiar chemic change produced by temperature, the materials absorbed into the body from infective processes, or the autoinfection from the intestinal tract, would in each condition produce its own peculiar chemic compound. Yet I believe a general basis of standard can be reached, at least sufficiently accurate from which to draw chemic and clinical deductions. For example, of peculiar effect on various structures in the body, brought about by an altered chemistry, I will quote from an article in which I reported a number of cases of enlargement of the thyroid gland in which the cellular elements of the thyroid structure were increased, the enlargement not being due to distended vessels, cystic condition of the gland or new growth. I reasoned the matter out as follows: It is a well-known physiologic and therapeutic fact that certain drugs have a selective action on certain tissues or organs of the body, *e. g.*, belladonna on the pharyngeal surface, sodium phosphate on the liver, etc. It is also a physiologic fact that the normal chemistry of the body controls the normal secretions from the various secretory organs, that any perversion from the normal necessarily alters the character and chemistry of the secretion, and that the products of such alteration act as irritants to certain parts of the body. The difference between this and drugs administered is that one is introduced into the body and one is manufactured within the body. I therefore reasoned that under certain conditions there was precipitated—due to perverted chemic reaction—a certain material which, circulating through the blood, had a selective action on the thyroid gland, acting as an irritant to that gland and stimulating its blood-supply. While the treatment of these cases reported was largely empirical, I believe that the drug introduced into the body by its chemic action altered the chemistry of the material which was acting as an irritant, either rendering that irritating material inert or forming a compound which was non-irritating. I was convinced that from the study of the saliva we could determine to a great extent any variation in the

chemistry of the body. As these various secreting glands receive from the blood the supply from which they elaborate certain chemic compounds, if an analysis be made of the composition of such secretion it would give a good index to the general condition of the individual, and while in many cases the deductions have to be based on or associated with clinical observation, I soon found them to be of immense value from a standpoint of diagnosis.

Some work has since been done in this line. Michaels of Paris, in his admirable paper read before the International Dental Congress, 1900, was the first to call attention to this subject in its relation to dentistry; and Kirk of Philadelphia has since taken up the investigation.

A few cases will serve to illustrate the import of the saliva from a standpoint of diagnosis, and I will refer only to those which are intimately related to our own specialty. The first case was as follows: Mr. C., aged forty-two, consulted me in regard to what he supposed to be a catarrhal condition associated with ozena. His breath was most offensive, but it was not the penetrating, clinging odor observed in atrophic rhinitis with ozena. He had observed the condition rather suddenly, and it had existed continuously for some four or five years. His history was absolutely negative as to any catarrhal condition other than an occasional cold. He had consulted specialists both in this country and abroad, not only as to the possibility of the odor coming from the nose or some of the accessory cavities, but had also consulted specialists on diseases of the stomach, as well as having had a thorough inspection of all his teeth. He had been told that he had practically no catarrh, and as his digestion was good and nothing found wrong by analysis of the contents of the stomach, the source of this odor was quite puzzling. After a thorough examination, and knowing that the men under whose care he had been were most thorough and competent in their line, I reasoned that there must be some source of the disagreeable odor outside of the parts already mentioned. As this was in the winter of 1895, and as my attention had been called to the import of the secretions by other conditions, as well as a statement made to me by the patient, I decided to investigate the saliva. The statement which he made to me, which was most significant, was this: That while his appetite was very good, and when his olfactory nerve was stimulated by the odor of a delicious meal, causing his

mouth to water, the disagreeable odor and taste became so pronounced as to almost nauseate him. I then collected some of the saliva. The method for its collection I learned from my experience in a dentist's chair—that after sitting with your mouth wide open for a few minutes you have a most profuse flow of saliva. This method practised just before meal-time enabled the collection of quite a large amount of the secretion. The offensiveness was at once detected. Now, whether this offensiveness was due to a chemic reaction brought about by the mixing of the various salivary secretions and its exposure to air, I am unable to say; but one thing was certain, that when the secretion was placed in a sterile bottle it at once demonstrated the source of the odor. After experimenting with a number of solutions I was able to demonstrate the presence of a sulphocyanid which, with the ammonia salts, caused rapid decomposition.

I have studied two other cases similar to the one quoted, in which the odor unquestionably came from the saliva. Another case was a peculiar form of *leukoplakia,* in which I believe the strange change brought about in the surface epithelium was due to some chemic compound formed from the salivary secretion. Four other cases which I studied were peculiar ulceration involving the tongue, lips and buccal mucous membrane. The ulcers resembled very much those associated with certain diseases of the stomach and described as *aphthous* ulcers. The salivary secretion in each case was strongly acid, showing the lack of proper oxidation. Remedial agents directed toward the changing of the chemic reaction of the secretion speedily effected a cure in three cases; the fourth patient is still under observation, but much improved.

My studies of the saliva have been very much in the same line as Michaels', although not so extensive, and the deductions are practically the same as he gives below. First, the study of the normal healthy saliva; second, the saliva from hypoacid individuals, and third, the hyperacid condition. He also investigated the function of the biliary principles and the presence and absence of them in the blood plasma and in the salivary secretions. His investigations proved that many of the substances found in the saliva by chemic analysis could be traced to this source. This is significant, as the presence or absence of such material would enable one to determine

the presence of hepatic toxins. He also showed that modifications of the saliva were in direct relation with constitutional diatheses.

As the tissues and secretions depend upon the blood plasma, any dyscrasia then would modify the chemic composition of the body and produce local or general manifestations. According to Ducloux, hypoacidity favors chemic changes in the tissues, in hypoacid conditions all the oxidation processes are exaggerated, and in hyperacid conditions oxidation is incomplete; as a result there is an increase in the quantity of organic acids. By the ordinary litmus test blood is normally alkaline, but as Douin and Gautrelet have shown, if we study the distribution of the acids and bases of the blood plasma we see that the reaction is really acid, and if the acid waste products are not eliminated this acidity is increased. The secretions and excretions then become of an acid reaction. This is illustrated in certain of the chronic diseases in which we have a constant characteristic symptom in the increase of the acidity of the urine.

"The ammoniacal salts and sulphocyanid in healthy saliva are in equal proportion and in very small quantities; in the hypoacid condition the ammonia exists in greater quantities than the sulphocyanid and tends rapidly to decomposition. In the hyperacid condition the sulphocyanid is in excess, and the tendency to decomposition is not so great as in the hypoacid condition."

Naturally, as Michaels states, it was necessary to investigate the histochemistry of normal saliva, concerning which subject the literature is very meager. Gould covers practically all the literature on the subject in his definition. He defines the saliva as the mixed secretion of the parotid, submaxillary and sublingual glands, and the small mucous glands of the mouth. Physiologically, three kinds of secretion may be distinguished; a serous from the parotid, a mucous from the mucous, and a mixed secretion from the submaxillary and sublingual glands. Mixed saliva is opalescent, tasteless, alkaline, and has a specific gravity of 1004 to 1009. The daily quantity secreted is approximately 1,500 cubic centimeters. (Bidder and Schmidt.) Saliva contains serum albumin, globulin, mucin, urea, an amylolytic ferment called ptyalin, a proteolytic and a lipolytic ferment, also salts, among which is potassium sulphocyanid, derived especially from the parotid gland. Among formed elements are epithelial cells, salivary corpuscles and bacteria. The functions of the saliva are physical and chemic. Its physical function is to

moisten substances, facilitate tasting and aid deglutition and articulation. Its chemic action depends upon its ferments, the most important of which is ptyalin. This converts starch into dextrin and sugar. The proteolytic and lipolytic ferments are not important. It is possible that any other fermentation save the amylolytic is due to bacteria.

"It became necessary, therefore, to pay special attention to saliva, its essential physical and chemic properties, and its changes in composition, and the relation of these factors to pathologic states. It was found that the saliva, like all recrementitious secretions, is liable to physiologic oscillations in constant relation to the changes in the fluids and solids of the body. The saliva is swallowed as soon as it is produced; its emission is followed by a new absorption, and this results in the formation of a sort of circuit very interesting to notice, and of which account must be taken; for the passage of the saliva into the blood effects, under normal conditions, a sodium combination; while it is eliminated in a condition which varies, at times being acid, and at other times alkaline or neutral. On the other hand, every crystallizable chemic principle, every acid, alkaline or neutral salt, even the alkaloids, biliary pigments or the free acids, circulate in the plasma in variable proportions, and are found in the saliva in certain diathetic proportions. The organoleptic properties of normal saliva are not characteristic, except when compared with diathetic saliva, but in studying the differences we learn quickly how to recognize and distinguish one from the other. By reason of the numerous characteristics which saliva presents in the different conditions of health, the following problems have arisen for consideration: 1. What are the principles which differentiate physiologic from pathologic saliva? 2. Is there any correlation between the chemistry of saliva and the different diseases? 3. Is the composition of the saliva simple or complex? 4. Is it possible to establish a classification of the organoleptic characteristics of saliva and refer them to particular conditions of health? 5. Is it possible to point out the causes of the variations of saliva?

"Certain specimens of saliva are clear, liquid and transparent, while others are viscid and thick. Some are reddish, yellowish or greenish in color, while others are as clear as water. This must depend upon the chemic composition. Some have a great quantity

of froth, others have very little, or even none at all. In the space of two days some kinds decompose, while others even after a year have no odor. Chemically, some contain sulphocyanid in different proportions, others do not contain any at all. In some we find crystalline salts; others have none. Other specimens contain fatty substances or emulsions, and others biliary pigments or urobilin."

The altered chemistry of the saliva presents many possibilities from an etiologic standpoint. It is quite possible that many forms of indigestion and diseases of the stomach and intestines may be brought about by the altered chemistry of the saliva. A great many morbid processes are traced to uric acid in some of its many forms, but I believe that many other substances equally important are deposited and eliminated, which act as irritants, not only causing stomach and intestinal diseases, but also may explain many of the so-called reflex neuroses, *e. g.*, hay-fever. It is a well-known clinical fact that saliva from certain individuals is exceedingly poisonous, as indicated by the infectious wound produced by the bite of such individuals, showing that the saliva may be the site of poisonous pathologic compounds as well as physiologic compounds. It is quite probable that some of the so-called reflex diseases, for example, asthma, if the cause could be traced, would probably be found to be due to a perverted salivary secretion.

Unquestionably, the chemic reaction of the secretions of the body is an important factor in the susceptibility of individuals to disease. I think there is no doubt that the fact that at one time the individual resists disease and at another time succumbs can be largely explained on this basis. To be sure, it is a question of resistance on the part of the individual, but that resistance is largely controlled by the chemistry of the cell or secretion. It also demonstrates the fact of the accumulative phenomena of certain of the diseases, as is illustrated in uric acid diathesis, which Haig has described as uric acid storm. There is no reason why these same phenomena could not occur as the result of the accumulation of *other materials* brought about by chemic changes which lessen oxidation and tend to precipitation and accumulation of various morbid products.

The administration of drugs for the relief of, for example, an infective process probably affects such a process beneficially, owing to the fact that in its action it changes the chemistry of the secretions and blood constituents, thereby producing a chemic compound

which either prevents the formation of infectious material or alters the nidus of infection to such an extent that it is not suitable for the growth of bacteria.

DISCOLORATION AND BLEACHING OF TEETH. By J. P. Buckley, Ph. G., D. D. S., Chicago. Read before the Chicago Odontographic Society. Some time ago I had the honor of presenting to this society a paper on the subject of bleaching teeth. Then I discussed chiefly the cause of the discoloration from putrescent pulps, taking it up entirely from the chemical point of view. It is my intention to-night to present some thoughts in confirmation of the chemical theory of the discoloration of teeth presented in the above mentioned paper, and also to pay due attention to the selection of the proper chemical, and the details of the actual process of bleaching.

One of the best papers recently written on this subject is by Dr. N. S. Hoff. [DENTAL DIGEST, December, 1902.] While he did not discuss the subject with reference to the cause of the discoloration from pulp decomposition, he took occasion to call attention to the theoretical aspect in the following forcible language: "It may be of advantage to study this question from its theoretical aspect; but should we attempt to do so we are likely to become disheartened, as the problem becomes so complicated that it is practically incapable of complete solution." Again he says: "Notwithstanding these difficulties, successful methods of bleaching teeth will never be made practicable until some definite theoretical knowledge is obtained. This may be secured from laboratory research, but it must necessarily be confirmed by clinical observation, if it be not an actual deduction from successful clinical experience." These words clearly express my views on this phase of the subject.

The first problem which presents itself for solution in this connection is to ascertain if possible what products are formed by the process of pulp decomposition that ultimately discolor the tooth structure, and until this question is definitely settled we shall be groping in the dark, for we cannot with any assurance select a chemical and expect it to destroy a pigment, the chemical nature of which we know nothing. We are taught that in so far as the chemical composition is concerned the pulp tissue differs in no particular essential from that of the other tissues of the body. Understand

me to say, "in so far as the chemical constituents are concerned" —not histologically nor structurally, but chemically. As this tissue then becomes irritated, we have the successive stages produced which, if unchecked, will ultimately lead to the death of the pulp; namely, the irritation would produce hyperemia, followed by inflammation, at which stage diapedesis takes place. The inflammatory exudate cannot be absorbed, owing to the absence of lymphatics in the pulp tissue, which condition of affairs causes congestion, followed by stasis and the death of the pulp. From this we learn that when the pulp dies we have present in the pulp chamber not only the exudate, which consists of blood corpuscles and fixed tissue cells, but also an abnormal amount of blood. As this dead tissue then is invaded by a microörganism of a pathogenic nature, we have a rearrangement of the elements which compose the tissue, new compounds are formed only to be broken up, and other compounds produced. This rearrangement of the elements, this breaking up of the various complex compounds—known in pathology as the putrefying process—goes on until we have produced as the final products such simple compounds as water, carbon dioxid, acetic acid, ammonia, methane, hydrogen sulphid, etc., and there still remains that which you have all observed—a semi-putrid substance which I believe to be largely composed of fats. We have every reason for believing, then, that as the pulp tissue is decomposed the dentinal fibrillæ are also broken up, the tubuli are enlarged by the action of these microörganisms, and there remain within them little globules of fat which can be observed by the aid of the microscope. Simultaneously with the breaking down of the pulp tissue the inflammatory exudate and blood are decomposed, the hemoglobin which contains iron is broken up, and this metal is liberated only to become united, in all likelihood, with the negative radicals of the acids produced by the decomposition of the pulp tissue, forming salts of iron.

It is quite generally conceded by those who have given this phase of the subject their attention that the discoloration of a tooth containing or having contained a putrescent pulp is due to some salt of iron. I would change the thought slightly by saying I believe it to be due largely to a compound of iron—making a chemical distinction between a salt and a compound of a metal. This conclusion is based on the fact that ammonia being one of the final products of

the putrefying process will unite with the water present, forming a reagent which will precipitate the soluble salts of iron, producing the compounds ferrous or ferric hydroxid, depending upon the form in which the salts previously existed; and as the acids produced are organic and weak, the *ous* compounds in all probability are formed.

It is in connection with this thought that I wish to make two statements. *First,* I believe the compound of iron which is ultimately produced by the decomposition of the pulp, air excluded, is ferrous hydroxid, a white compound. *Second,* I believe the compound of iron which is ultimately produced by the decomposition of the pulp, air admitted, is ferric hydroxid, a reddish-brown compound. This compound, it seems to me, is the so-called pigment with which we have to contend in the bleaching of these yellow teeth, discolored from this source. Should the tooth have a dark appearance, it perhaps is due to a small amount of the black ferrous sulphid, or a failure of the ferrous hydroxid to become completely oxidized into the ferric form, owing to a lack of moisture or oxygen. These statements are confirmed, to my mind, by the following well-known clinical fact or observation:

You can all readily recall cases in your practice where some anterior tooth is giving trouble. By careful examination you find none of these teeth containing cavities, but one of them is sore. It will not respond to the thermal test, and by these and other means you decide that it contains a putrescent pulp. It may have died from the injudicious use of a regulating appliance or from some traumatic injury; at any rate, it contains no cavity, yet a putrescent pulp. Bear in mind that at this time, so far as the *color* of the tooth is concerned, you cannot distinguish it from any of the adjacent teeth which contain living pulps. I believe, then, that the compound of iron which is in that tooth is ferrous hydroxid, a white compound, the pulp having died, air excluded. You open through the lingual aspect of the tooth, seal in a remedial agent, which you know under ordinary conditions will not discolor teeth, and as you insert the medicament air is admitted. The patient returns in two or three days and a greenish cast is noticed. Ferrous hydroxid, when moist and exposed to air, has the property of turning green, then black, and finally changing to the reddish-brown ferric hydroxid. Chemically speaking, the ferrous compound,

when moist and exposed to air, oxidized into the ferric form. You continue to treat the tooth, fill the root, the cavity, and dismiss the patient. But in two, four or six months, if you have occasion to see the patient, you will invariably find the tooth much darker than the other teeth. I believe, then, the compound which has discolored this tooth is ferric hydroxid, mixed perhaps with a small amount of the black ferrous sulphid.

I am not unmindful of the fact that many teeth can be found containing a putrescent pulp, and no cavity, that are very dark. But this does not affect the theory herein presented. In reality, this only adds another clinical fact which confirms our theory. Clinical experience will prove that a tooth containing a recently decomposed pulp is not discolored. There will be no visible change in color until it receives oxygen from the air through a cavity, or from the red corpuscles of the blood, which latter process would take much longer to effect the change.

Having thus far brought to your minds the theoretical aspect, as it appears to me, the questions of the chemicals to be used and the details of at least one method of bleaching may well be considered. However, before discussing this phase of the subject, I wish it understood that I am not one of those who believe all discolored teeth can be permanently bleached, regardless of the cause of the discoloration, the condition of the tooth structure and the length of time the tooth has been discolored. These conditions must be taken into consideration.

Teeth are discolored principally from three sources, namely, putrescent pulps, metallic fillings and remedial agents. In this day of progressive dentistry we should seldom be called upon to bleach teeth other than those discolored from the first source mentioned; for any dentist who *improperly* inserts an amalgam filling in any tooth, especially an anterior tooth, would be severely criticised, as would also the dentist who employs in the treatment of pulpless anterior teeth such remedial agents as are known to stain the tooth structure. It is not my duty in this paper to discuss the *proper* method of inserting amalgam fillings, but by way of an explanation to the foregoing statement it may be advisable to state that if all amalgam fillings were inserted in cavities as carefully prepared as for gold fillings, using relatively the same skill and

polishing when set, the liability to discolor would be reduced to a minimum.

The selection of a chemical which will give the best possible result depends chiefly on the cause of the discoloration. If discolored from the decomposition of a pulp, or from amalgam fillings, the direct oxidation method will unquestionably give the best results. Should the tooth be stained from remedial agents, the selection of the chemical must be governed by the agent which has stained the tooth; for in many of these cases the reducing process gives far better results than the oxidizing method.

The best direct oxidizing agent which can be employed in bleaching by this method is sodium dioxid, used in the powder form. In cases where a discolored tooth contains a putrescent pulp it can be treated and bleached at the same time by the careful use of a freshly prepared *solution,* made by slowly adding sodium dioxid to distilled water. This forms a solution containing sodium hydroxid and hydrogen dioxid, as

$$Na_2O_2+H_2O=2Na\ OH+H_2O_2.$$

This solution must always be prepared when needed, as the sodium hydroxid gradually decomposes the hydrogen dioxid into water and oxygen. It is also good practice to use this solution instead of pyrozone in the treatment of putrescent pulps, when the teeth are not discolored, as the hydrogen dioxid in the presence of caustic soda being gradually decomposed, nascent oxygen is liberated, which will completely sterilize, while the sodium hydroxid forms a soluble soap of the fatty contents of the tubuli, and this is easily washed out, thereby mechanically removing the iron compounds, which if permitted to remain would subsequently discolor the tooth. Care should be exercised not to force any of the solution beyond the apex of the root. It is scarcely necessary to mention this, however, as the same precaution should be observed in using pyrozone for the same purpose.

Method of Using Sodium Dioxid.—The first thing to be done, after having ascertained the cause of the discoloration, and having decided to use sodium dioxid, is to be certain your chemical is efficient. Many operators have tried this method and have failed to get satisfactory results, for no other reason perhaps, than that the sodium dioxid used was partially or nearly all decomposed. Exposure to moist air will decompose the chemical. That you may

be certain your chemical is not decomposed, I have devised the following simple test. Place about 1 gram of the powder in a clean, dry test tube, and add about 1 cc. of water. Enough oxygen should be generated to kindle a glowing splinter held at the mouth of the test tube without having to put the splinter down into the body of the tube.

The best results can be obtained by placing the dry powder in the cavity of the tooth to be bleached, and bringing about the reaction by dropping distilled water on the powder in the cavity. It being rather difficult to place a powder in a cavity, some little ingenuity is required to overcome this difficulty. My method is to place a thin platinum ribbon between the discolored and adjacent tooth, permitting it to extend below or above the cutting edge, as the case may be. White gutta-percha is now warmed and pressed against the lingual surfaces of the teeth covered by the rubber dam. This forms a pocket into which the powder can easily be placed, using a little gold or platinum spoon. The powder can be worked up into the root with a glass rod, which has been drawn out to a point. When the distilled water is dropped on the powder, the platinum can be bent so as to inclose the cavity while the reaction is taking place. As your success depends quite as much upon the mechanical removal of the coloring substance as upon the chemical, the tooth must be thoroughly washed after each reaction. This can best be done by using warm water and a bulb syringe, and letting a soft sponge absorb the water. The tooth is dried, and two or three drops of a 2 per cent solution of sulphuric acid are placed in the cavity. This is permitted to remain one or two minutes, when the tooth is again thoroughly washed. The acid will form soluble salts of the oxids that may not have been mechanically removed by the first washing. The cavity is again dried and, if necessary, the process is repeated, but usually two or three applications are sufficient. Better results seem to be obtained by letting the tooth dry slowly after the last washing. When dry, a paste of precipitated calcium phosphate and distilled water is forced up into the root, and burnished against all exposed dentin. This is thoroughly dried and a light-colored cement is used to form a base for the final filling, which should always be inserted before the rubber dam is removed. If the details have been carefully observed, and the cavity is hermetically sealed, there being no other cavities or checks in the en-

amel through which moisture can enter, the result will justify you in trying the method.

It may be well before closing to state that every precaution should be taken to prevent the sodium dioxid from coming in contact with the soft tissue, as the water in the tissue will unite with the chemical, forming caustic soda, which would completely destroy any soft tissue on which it acts.—*Review.*

PROBLEM IN PROSTHODONTIA. By R. Ottolengui in *Items.* The following is a record of a case which recently passed through my hands, and is here given because the solution of the difficulties presented is so obviously available in the presence of similar obstacles. The patient was an elderly man who had lost his four lower incisor teeth. He was wearing artificial substitutes with which he felt entirely satisfied, yet an examination disclosed the fact that the plate in use was slowly but surely causing the loss of his remaining teeth. The dentist who had served him had evidently taken an impression with plaster of paris, but the positions of the natural teeth, together with other conditions, had combined to prevent his obtaining an accurate model. The cuspids were fairly erect; the first bicuspids leaned towards each other a little; the second bicuspids tipped at a greater angle, and the molars still more so. Of course this tipping would not necessarily prevent an impression with plaster, as the fracture would not have been a great hindrance. It is mentioned in another connection. The gums along the lingual aspect of the teeth had greatly receded, so that the natural teeth appeared excessively long. There was an abundant flow of saliva, and a restless tongue.

The result of an attempt to take an impression with plaster was that a fairly good impression of the teeth themselves was obtained, as well as of the gum in the anterior part of the mouth, where the incisors were missing; but from the region of the cuspids backward the impression grew less and less accurate, because the tongue and saliva had combined to wash away the plaster before it had time to harden. The resulting model disclosed the lingual aspect of the teeth, but about the bicuspids and molars there was no representation of gum tissue. Of course it might have been possible with a knife to place a large mass of partially set plaster along these surfaces prior to inserting a tray, but it seemed undesirable to use so great a

quantity of material around teeth which were long, tipped together and loose, because of the difficulty of procuring fracture and ready removal from the mouth.

The previous attendant had apparently used the model as he found it, and the denture which he supplied rested on the gum in the incisive region, but did not reach the soft parts at all along the lingual aspect of the teeth. The result was, that having taken advantage of the inward tipping of the side teeth he was enabled to lock the fixture into position, at least for a time, but as the plate along its sides rested solely against the teeth, in every movement of mastication it operated as a wedge pressing forward and outwardly against the natural organs. The inevitable effect of a denture so retained was only too plainly to be seen; the two cuspids which resisted the greatest force of the stress were already so loosened that a careless observer might have attributed the looseness to pyorrhea, whereas they were merely growing less and less stable because of the constant stress and the lack of bony support due to the recession about their necks.

The procedure, which brought a most gratifying success, was as follows: Separate impressions of either side of the mouth were taken in plaster for the procurement of models upon which to form the Bonwill clasps, upon which reliance was to be placed for retaining the appliance. A third impression was taken with modeling compound, one that sets hard, and this was chilled with cold water prior to removal. It was fully comprehended that this would be inaccurate in regard to the teeth because of the draw, but it was expected that a moderately accurate impression of the gum tissues would be had. The model was poured, and the teeth cut off entirely, it being the intention not to permit the plate to touch the natural teeth in any place. Dies were made and a plate struck of pure (unalloyed) platinum, 28 gauge. This metal is quite soft. Having trimmed this to the desired shape, it was placed in the mouth, and, as anticipated, it did not fit satisfactorily. A plate of harder material, such as gold or iridioplatinum, would not have served, but the platinum, being soft, was readily pressed to accurate adaptation to the soft tissues, using the forefingers of the two hands and working them both at the same time along the opposite sides of the mandible. This accomplished, the plate was carefully removed from the mouth to avoid bending; plaster was poured upon it, thus securing a model which it would

fit; this was reproduced in zinc and used as a guide die to prevent alteration of shape during the subsequent steps. A stiff platinum wire was laid against the plate on either side, but not in the center. These stiffening bars were fastened by flowing twenty-carat gold plate over the platinum plate and bars, the two sides of course being done separately. The center being still soft, the plate was easily re-adapted on the zinc die, thus making sure that no warpage had occurred. Gold was then flowed over the central area, the ends being kept moderately cool. The plate thus stiffened throughout was found to fit the die accurately without need of swaging, which, however, could have been relied upon to make restoration to the true shape had it been necessary. Tried in the mouth the adaptation proved to be accurate, and the appliance was completed, Bonwill clasps on either side serving not only to hold the plate in place, but likewise acting as a brace for the slightly loosened bicuspids and molars, while from the fact that absolutely no bearing now causes stress against the cuspids, it is fair to anticipate that these will become tightened.

SUPPURATIVE PROCESSES INVOLVING THE MAXILLÆ. By Dr. Henry C. Boenning, Philadelphia. Read before the Northeastern Dental Association, 1902. As is known to all of us, these are exceedingly numerous and of the greatest possible variety. There are those that involve the sockets of the teeth without extending into the bone-substance; others associated with disease processes of the maxillæ proper; and still others that are located in the antrum, the nasal fossæ, and the parts associated with the maxillæ. We may say for classification that they involve the maxillæ primarily; and secondarily, by extension of disease from contiguous parts, the soft tissues and teeth.

Suppurative processes about the mouth are most frequently discovered first by the dentist, who in his minute examination of the structures of the oral cavity very often detects a sinus which has escaped frequent examination by the surgical practitioner. It is on account of the special opportunities of the dentist to discover disease processes in and about the oral cavity that I have selected a subject in which the dentist and oral surgeon are mutually interested.

The kind of suppurative process that takes place in the maxillæ

depends not so much on the tissue involved as it does upon the variety of microorganisms concerned in the pyogenic process. This is also a factor of much influence in regard to the rapidity with which the suppurative lesions proceed. For instance, those in which the germ is the staphylococcus as a rule extend over a long period, resulting in bone-softening, and often caries or necrosis from capillary obstruction; while the presence in profusion of the streptococcus often results in rapid obstructive and destructive changes, and extensive necrosis.

It is to be borne in mind that all suppurative diseases associated with the maxillæ are the result of the action of a pus germ; hence dental calculus, once considered *the* cause of pyorrhea, is only a factor, inasmuch as it causes irritation and opens the way for the intrusion of pyogenic microorganisms. Sanguinary or serumal calculus in itself is unable to cause the slightest pus-formation. The pus germ is necessary.

Certain suppurative processes, on account of their frequency and importance, claim the especial attention of the dentist and oral surgeon. Among such are pyorrhea alveolaris, alveolar abscess and antral empyema; and these will serve to illustrate many other lesions of the maxillæ associated with suppuration. We are familiar with the cause of pyorrhea so far as it concerns a pyogenic germ, which may be introduced in an infinite variety of ways, as by the use of an infected toothpick, or an unclean instrument, or infected substances placed within the mouth. A deposit of calculus about the tooth proper, forcing away the soft parts, may enable the germ to enter the socket by infiltration, but we are unable at present to fix upon any specific germ. A rare event in pyorrhea is to find *in the first instance* more than one socket involved. The sockets are infected consecutively—it may be very rapidly—and, as we have found by close inquiry and examination in such cases, with remarkable regularity. A careful examination of the purulent discharge in pyorrhea shows great numbers of very active microorganisms of several varieties. In greatest profusion is the staphylococcus, with colonies of streptococci in the form of twin spores and up to the fully developed germ. These are of course associated with pus cells and detritus, plus bacteria and germs of fermentation. I herewith present cultures of a recent case. [Specimens submitted.]

On removing the tooth from its socket it is found as a general

rule, in the lower teeth at least, that the action when at all extensive is most pronounced in the deepest part of the socket. The examination of the bone *in the vicinity of the socket* gives very remarkable results. It often presents evidences of decalcification, associated more or less frequently with limited or diffused caries and necrosis. In explanation of these conditions, and the difficulty of successfully treating pyorrhea, the alveoli of the cancellous bone-tissue in the vicinity of the sockets are usually found infested with colonies of pyogenic microorganisms. In two recent cases which presented the opportunity for the removal of bone in the vicinity of these suppurative processes, the specimens were submitted to bacteriological examination and development, with the result of procuring perfect cultures of both the staphylococcus and streptococcus in profusion. The presence of colonies of germs in the alveoli of the bone in all probability explains reinfection and recurrence of suppuration in pyorrhea, and other pathological conditions of the maxillæ associated with suppuration.

We have by patient treatment and attention entirely cured apparently suppurative diseases about the maxillæ, notably alveolar abscess, only to find later on in some cases a reestablishment of suppuration. Even after thorough treatment of a tooth, and perfect and complete filling of the canals under the severest conditions of antisepsis, alveolar abscess sometimes recurs. As in pyorrhea alveolaris, so I have found in some cases of alveolar abscess operated on infiltration of pyogenic germs into the structure of the maxillæ. This same germ infection takes place in the substance of the tooth, and incidentally suggests the wisdom of thorough mechanical and surgical cleanliness of the root in stubborn cases of pyorrhea. Antral empyema serves as another notable example of a suppurative condition or lesion of the maxillary bone. But the pathology in all is essentially the same, viz., infection by pyogenic germs, followed by bone-softening associated with or followed by limited caries—often necrosis.

Now a word as to the treatment I have found to give the best results in maxillary bone lesions associated with suppuration. First and most important is free drainage by an opening down to the disease, and sufficiently large, through which the microorganisms and products can be discharged and destroyed, the dead bone and detritus removed, and the involved tissues treated by antiseptics

and other agents required. It may become necessary, for instance, in order to save a valuable tooth in a case of pyorrhea, not only to wash out the socket at the cervical inlet, but also to open the socket above by means of a drill and the surgical engine, and in this manner secure complete and entire flushing of the involved tooth and socket. I followed this line of practice in several cases with good results; in fact, I was impressed with the rapidity of the reduction of pus-formation. The openings thus made subsequently filled up and the teeth became firm.

In alveolar disease it has been for years my practice, where conditions are recurrent and apparently not remediable by the means ordinarily employed, to open into the socket with a large bur through the external alveolar plate and cut away all soft and infected bone, and then destroy the germs with powerful antiseptics. I have found it necessary at times to bur away a rough apex or part of the tooth-root, as well as the bone involved. Of course all necrotic tissue found must be removed.

In antral empyema, which is unfortunately common, I have found the most successful treatment in chronic cases of suppuration to be a free opening through the anterior wall of the antrum. This I accomplish by raising the soft structure from the anterior surface of the body of the maxilla, and then by trephine or bur opening the antrum sufficiently to insert the point of the finger. I have often removed flakes of dead bone, shreds of tissue, also antral calculi, formed of mucus and pus, inclosing fragments of bone and shreds of tissue. Generally such accumulations are of offensive odor, about the consistence of cheese; but in one case, that of a young man, the mass removed was irregular in form, of a grayish yellow color, and as hard as a piece of chalk.

A large opening through the anterior antral wall has many advantages. It does not involve the loss of a tooth; the operation is very simple; and it enables us to clean out the antral cavity thoroughly, and so treat it by irrigations and antiseptics and by careful packing as to secure its obliteration by granulation and new tissue formation, or such changes in the tissues are effected as to eradicate the suppurative processes.

At the Garretson Hospital we have had numerous cases of suppurative lesions of the maxillae which have been directly traceable to the hypodermic introduction of obtundents for the purpose of ex-

traction. In many cases we have been able to develop the fact that no attempt was made on the part of the practitioner to secure oral sanitation prior to the introduction of the hypodermic needle. I call attention to these cases because I think that suppurative lesions of the maxillæ are on the increase. Of course it is a matter of the greatest importance to protect the individual against sepsis, and not only the obtundent used, but also the instrument wherewith it is applied, should be sterile, and unless the tissues concerned in the operation shall be antisepticized all the former conditions will be futile. A clean needle, thrust into or through gum tissue that has not been effectually cleansed, will simply carry upon the point and opening of the needle any germs that may be on the surface deeply into the tissue; and while the diseased tooth for which the obtundent was applied may be removed by the subsequent operation of extraction, the individual in reality is inoculated on account of a want of sterilization of the parts punctured.

Another factor in the etiology of suppurative diseases of the maxillæ is a want of sufficient care of the mouth prior to and subsequent to the operation of extraction. Some of the most serious conditions associated with suppuration and necrosis of the maxillæ that I have ever seen have been the result of lack of persistent oral sanitation subsequent to extraction. I think that these cases could be reduced to a minimum if the practitioner were to make the mouth surgically clean, if possible, prior to the operation, and then instruct the patient how to keep the mouth in that condition after the extracting. And further, in order that his views on antisepsis should be carried out, would it not be well if the practitioner could see the extraction case regularly until all danger of infection were over?

There are cases that despite the most skillful and painstaking care of the dentist, and the most heroic methods of the surgeon, fail to improve, much less get well. What is to be done with these? Within a relatively short time there has been largely developed, through the activity of independent investigators, a system of animal therapy and the application of certain antitoxins to neutralize certain important soils in the blood and tissues in which the pathogenic organisms might grow. At the Garretson Hospital we have had numerous opportunities, particularly during the last winter, to observe the effect of the application of staphylococcus and streptococcus antitoxins, and also the application of the various products of animal therapy,

such as the extract of thyroid, suprarenal capsule, protonuclein, and other agents of that kind. We frankly confess that our results have not been noteworthy, save perhaps in one case, which may be of course purely coincidental; but if this case and others like it be prophetic of the results to be expected from the use of these materials, then all our methods as now understood for the treatment and care of suppurative lesions of whatever character, not only in the maxillæ, but all parts of the body, will be entirely revolutionized. In the case alluded to the practice was, as is usually our method, the injection of from 5 to 10 c. c. of Mulford's antistreptococcus toxin. In this case, which had extended over a period of years, the result was apparent, prompt and satisfactory, inasmuch as the pus-formation rapidly diminished and almost entirely ceased.—*Cosmos.*

CARBOLIC ACID BURNS AND THEIR TREATMENT. By Dr. W. F. Litch in *Brief.* Few drugs have a more diversified range of physiological action than carbolic acid; locally it is anesthetic, antiseptic and escharotic; internally a gastro-intestinal irritant, and systemically a cardiac, vasomotor, and respiratory depressant, capable in sufficient dose of producing rapidly fatal results. As carbolic acid is largely employed by dentists, it is for every reason desirable that they should be advised as to the remedial measures most likely to prove effective in case of accident in the use of the drug. While the coagulant effect of carbolic acid upon the albumin of animal tissue to a certain extent limits its penetrative effect, but a short period of contact with a concentrated solution is required to set up a destructive process followed by inflammation more or less severe and prolonged.

One of the most common complications in the use of carbolic acid in dental practice is its accidental contact with the lips of the patient in making applications to the teeth or gums. No small percentage of the so-called "fever sores" which develop immediately after a visit to the dentist are doubtless due to this cause. Only by the most scrupulous care in making the application can such accidents be prevented. Frequently some slight excess of acid oozing from the pledget of cotton used as a dressing will flow along the shaft or blades of a carrier and thus be brought in contact with the lips of the patient; a slight burning sensation being the only immediate symptom which such contact occasions. This, however, is a characteristic ef-

fect which should be promptly treated, especially if on examination the whitish eschar characteristic of a carbolic acid burn is found.

Many remedial measures for carbolic acid burns have been recommended, and among these alkaline solutions have held a leading place; but while carbolic acid forms compounds with the alkaline bases which are much less destructive to tissue than the acid in its free state, its neutralization by such agencies is neither prompt nor complete. Pure water, although a solvent for carbolic acid, dissolves it slowly, and, in certain proportions, with some apparent difficulty and incompleteness. Vinegar too has been recommended; this, although simply an aqueous solution of acetic acid, takes carbolic acid into solution much more freely than does pure water, while at the same time it materially lessens the escharotic power of the drug.

Of all the agents hitherto employed to limit the destructive effects of carbolic acid alcohol, when promptly applied, is the most effective. This superiority is due to the rapidity and completeness with which the acid is taken into solution by alcohol, as well as to the lessened escharotic effect of the acid when thus combined. Hence, whenever the contact of acid with the lips or face of the patient is perceived or even suspected, alcohol should be promptly and freely applied to the part until the acid is as far as possible washed away. The longer the period of contact before treatment is begun the more deeply, up to a certain limit, will the acid penetrate and the less effective the application will prove. Alcohol does not penetrate the skin very readily, and probably has but little effect in modifying the action of the acid which has already penetrated the epidermis and acted upon the albuminoid constituents of that and the dermal tissue; but while under such conditions alcohol may prove helpful in but a slight degree if at all, it can in no sense prove harmful.

As a local antidote alcohol is equally as effective for carbolic acid burns in the mouth as upon the lips and face. Incidentally it may be remarked that when applied to those portions of gum tissue which are freely and constantly bathed with saliva carbolic acid, even in saturated solution, is comparatively harmless, unless the application be continuous and prolonged. This immunity may be attributed both to the neutralizing and protective character of the saliva, and the relatively low absorptive power of gum tissue, due to the density and toughness of its structure.

The antidotal value of alcohol is not limited to cases involving the

cutaneous surface or the oral mucous membrane, but when properly employed is of great value where the acid has been swallowed in poisonous doses. For this purpose the official alcohol diluted with about its own volume of water is recommended. If the patient cannot swallow, this should be passed into the stomach by means of the stomach tube, and usually must be so removed, as the alcohol must not be allowed to remain, and emetics cannot be depended upon for its evacuation, owing to the deadened sensibility of the gastric nerve filaments produced by the acid. The dilute alcohol lavage should be repeated several times, or until the washings come away free from the odor of acid.

While alcohol thus applied will neutralize the destructive local action of the acid, it will, if allowed to remain in the stomach, facilitate rather than retard its absorption into the circulation, thus promoting the toxic effect of the poison upon the general system. Alcohol cannot be regarded either as a true chemical or as a proper physiological antidote for carbolic acid, for the reason that while it neutralizes the escharotic effects of the acid, in a manner not clearly determined, a definite non-toxic compound is not formed by the admixture.

So far as is now known, the best available chemical antidote is a soluble sulphate, such as Epsom or Glauber salt, in solution in water. These, theoretically at least, form with carbolic acid a sulphocarbolate which is inert because insoluble. The salts above named have the further advantage that even if they fail to prove chemically antidotal, they will through their cathartic power assist in eliminating the poison by intestinal purgation. That they will enter the circulation and, as has been claimed, there act as chemical antidotes to the carbolic acid present in the blood may well be doubted. The addition of Epsom salt to alcohol used as a local application for carbolic acid burns has been recommended, but is of doubtful advantage, as the acid can be washed away by alcohol much more rapidly than it can be chemically neutralized by magnesium sulphate.

For the systemic effects of the poison the true antidotes must be physiological rather than chemical. The profound vital depression produced by the absorption of toxic doses of carbolic acid is best antagonized by excito-motor stimulants such as strychnin or atropin, hypodermically administered; by faradization, artificial respiration, the intravenous infusion of normal saline solution at a temperature

from five to ten degrees above blood heat, and by the general maintenance of the body temperature through heated surface applications aided by active friction.

The chief purpose of this paper has been to call the attention of dentists to the value of alcohol as a remedy for those accidental injuries from carbolic acid most likely to occur in their special line of work; but the drug is so swift and potent a poison, and in the present chaotic state of laws regulating the sale of poisons is so fully accessible to the general public, that it is to be found in almost every household, and cases of poisoning from its use either by accident or design are of daily occurrence. Hence the occasion may arise in the experience of the practitioner of any branch of the healing art when a knowledge of the line of treatment above briefly outlined may prove helpful in the saving of human life.

ALKALIES IN RELIEVING PAIN. By Sir Lauder Brunton, M.D., F.R.S., LL.D., London. The common physiological experiment of testing the reflex action in a decapitated body by dipping one foot into acid is instructive as showing the great power of acids to stimulate sensory nerves and the disappearance of the stimulation when the acid is removed. The presence of acid in a carious tooth is a most potent cause of toothache, and my friend and colleague, Sir Dyce Duckworth, has shown how toothache may be stopped almost magically by putting into the decayed spot a little cotton dipped in sodium bicarbonate and thus neutralizing the acidity. The sodium bicarbonate may be mixed with laudanum or cocain, or both, in order to lessen the irritability of the pulp of the tooth, but very often this is unnecessary, and the sodium bicarbonate is quite efficacious by itself. When pain is felt, not in one tooth only but in all, it frequently depends on irritation of the roots of the teeth just at the edge of the gums by acid fluid in the mouth, the gums themselves being sometimes a little retracted. This pain may be generally removed by rubbing a little sodium bicarbonate along the edge of the gums with the fingers or by thoroughly washing the mouth out with some sodium bicarbonate in water. The strength of the solution is of no great importance, but a teasponful of bicarbonate in about half a tumbler of water usually answers very well. Such a solution, too, is very useful in cases where toothache depends upon caries occurring between teeth where cotton cannot well be applied. By squirting the

solution between the teeth or by rubbing bicarbonate between by means of a pointed wooden match the pain can often be relieved. Some recent observations that I made appear to show that diminished alkalinity of the blood may tend to cause pain in somewhat the same way as a positive application of acid to a nerve.

About six weeks ago I was unfortunate enough to get my hand poisoned by infection with a microbe which proved on examination to be a pure cultivation of staphylococcus pyogenes aureus. After the first wound had healed it was succeeded by a number of painful boils. These, like the first, were excessively painful, the pain sometimes being of a dull burning character like that caused by a burn, but at other times it became exceedingly sharp, as if a number of wasps were stinging all at once. The burning pain was more or less continuous, but the severe stinging pain only came at intervals. It was only at the end of four or five weeks that I noticed that the stinging pain usually came on most severely between three and four hours after a meal. This is the time when the alkalinity of the blood is undergoing diminution by the absorption from the stomach of hydrochloric acid which has been secreted for gastric digestion, as well as of any other acid which may have been contained in the food or formed from it.

On some occasions there seemed to be acid eructations about the time that the stinging pain came on, and I thought that this pain, like a stomach cough, might be due to summation of stimuli. I accordingly took large doses, ½-teaspoonful to a teaspoonful of sodium bicarbonate by the mouth, with benefit, as I thought, both to the gastric acidity and the pain in the boils. One day, however, it occurred to me that instead of the stinging pain due to a summation of stimuli proceeding from the boils themselves and from the stomach, it might be caused by lessened alkalinity of the blood circulating in the boils. I accordingly applied a solution of sodium bicarbonate directly to the boils themselves, instead of taking it by the mouth. The result was most satisfactory, for in a few minutes after the application the intense stinging pain was relieved. This result suggests the possibility of a more extended use of alkalies in cases of neuralgia, and it also may help to explain the relief that is afforded in some cases of neuralgia by taking food. Hitherto one has been inclined to believe that the relief of pain was due to local depletion of the painful part by derivation of blood to the stomach during diges-

tion, but in view of these observations it appears not unlikely that this explanation is only a partial one, and that the relief really depends more on secretion of acid into the stomach and a consequent increase in the alkalinity of the blood than to any change in the circulation. If this be so, then the free administration of sodium bicarbonate and potassium bicarbonate in such cases may help to give relief.—*British Medical Journal.*

DIGESTION. Professor Pawlow (*Medical Record*) has been recently undertaking experiments for the purpose of investigating the comparative digestibility of various kinds of food, and has obtained some interesting and remarkable results. In the main these experiments were as follows: The gullet of the animal was cut in sections and fixed to the neck, so that when it ate the food merely fell to the ground. The stomach was divided into two parts, one into which no food was allowed to penetrate, while into the other was placed the food necessary to keep the dog alive. The experiments showed that offering the dog food which he liked caused an abundant secretion of gastric juice, although nothing had entered the stomach. If he were offered a tidbit the flow of gastric juice was much more abundant than if he were given food which he merely liked, showing that appetite is needed to set the gastric juices working properly. Thus, Pawlow's experiments proved that when eating without appetite the food was either not digested at all or very badly digested.

The investigator also says he has shown that the brain transmits its orders to the stomach by means of two pneumogastric nerves. These nerves were cut on a specially "prepared" dog. Then the dog was given raw meat, which did not reach the stomach, but no gastric juice whatever was secreted. No method of mechanical excitement produced juice. Further, if bread or cooked white of egg were introduced into the stomach—the dog being unconscious that such was the case—the food remained for hours without causing the least secretion of gastric juice, but after administering extract of meat or milk first the secretion would be provoked. The conclusions drawn from the foregoing experiments are that in the poorer classes a man lives far more from his muscles than from his brain, hence the desire for food. It is rather a healthy sign to be somewhat greedy. The reason that dyspepsia is so common among men of letters and their like is

that their brain is so much occupied with their work that they eat without thinking of the food taken. The pneumogastric nerves have not been called into action, and in consequence the gastric juice is badly secreted. It is therefore not conducive to good digestion to be absorbed in a book or newspaper at meals. In the case of consumptives with little or no appetite, and insane persons, who often refuse food, the gastric juice may be set in motion by taking milk or broth an hour or so before a meal.

NECROSIS OF THE LOWER JAW. Dr. Wood reported the case of a man aged 41 years. The patient was of rather delicate constitution, but had no history of specific disease. He was suffering from a suppurative periostitis of the left half of the lower jaw. There were no decayed teeth, but pus was coming from the edges of many teeth, and the periostitis seemed to have arisen from the pyorrhea alveolaris. The speaker made an external opening near the angle for drainage and obtained pus. Some relief followed. On March 22 he made an external opening in the median line and two incisions parallel to the jaw on the inside of the mouth. All these incisions communicated along the jaw bone beneath the periosteum and continued to discharge large amounts of foul-smelling pus. The patient's general condition precluded a radical operation, and he determined to remove the bone in pieces as the necrotic process proceeded, while by free drainage, extra nourishment and medication he hoped to husband his vitality. During April ten teeth were lifted out with an artery clamp. During May, as the gum receded, large portions of the jaw were removed at intervals with the sharp spoon, rongeur and straight-bone forceps. On May 30 the last of the front portion of the body came away, and on June 10 the last of the ramus, including the condyle and coronoid process, was extracted. This was done through the mouth, with an artery clamp without an anesthetic. From the beginning of the removal of bone the pus decreased, but not until removal was complete did the flow cease. The patient gained rapidly in weight and in August took up his business duties. As the periosteum was not destroyed there has been a rapid formation of new bone, the amount of which is surprising. The portion of the jaw remaining, the right side posterior to the cuspid tooth, had a tendency to fall in. This has been overcome by a rubber spring attached to bands around teeth on the upper and lower jaw.

When the solidity of the new bone has increased a little more his dentist expects to fit a plate with a thick border on the new gum.—*Brooklyn Med. Jour.*

TACTILE SENSATION IN TEETH. C. T. B., in *Jour. Brit. Dent. Assn.* I have come across the following in one of Huxley's letters: "Old Tomes once published the opinion that the contents of the dentin tubules were sensory nerves, on the ground of our feeling so distinctly through our teeth. He forgot the blind man's stick." It is possible that Huxley's memory was at fault on this occasion. Mr. Charles Tomes says of the fibrils: "Nerves, in the ordinary sense of the word, they are not, and *have never been supposed to be.*" (My italics.) In these days of improved methods of dental microscopy we seem to be coming round once more to something like the views that were probably held by Sir John Tomes. I imagine that the blind man's stick would be represented only by the dentinal matrix and its enamel coating. Experimenting on my own teeth, I notice that if the points of a pair of dividers are drawn lightly down the labial surfaces of two contiguous teeth they are felt as one point only, whereas, if laid on the outside teeth of a series of three two points can be distinctly felt. Prof. Haliburton says, with regard to tactile sensation in the skin—"It would appear that a certain number of intervening unexcited nerve-endings are necessary before the points touched can be recognized as separate." In the case of the teeth, the intervening nerve-endings would be supplied by the nerve-endings in the intervening tooth, the nerve-endings of one of the teeth touched being excited as *one* nerve-ending, owing to the hardness and rigidity of the enamel casing. May we not regard the primitive fibrils arising from the plexus of nerves beneath the odontoblasts, described by M. Magitot, Mr. Hopewell-Smith and others, as arborising round the "odontoblast" cells, and so converting them into sensory end-organs? Prof. Haliburton instances "certain epithelial cells of the surface of the body" which "become peculiarly modified, and grouped in special ways to receive the impressions of the outer world; these send an impulse into the arborisations at the termination of the axis-cylinders of the nerves which envelop the cells." Some of these are the hair-cells of the semicircular canals and the cochlea, and the rods and cones of the retina. The chief objection to including the odontoblasts that I know of is their develop-

ment from the mesoblast. However, I suppose notions as to the functions of the odontoblasts will be in the melting pot for some time to come, and in this connection I have been rather struck by one of Mr. Hopewell-Smith's micrographs. It shows a "*hypersensitive* eroded surface with dark dentinal tubes," and beneath that "freshly deposited fine-tubed dentin." But, although beneath the healthy dentin there is a well-defined layer, beneath the hypersensitive dentin there are *no odontoblasts.*

LATERAL SUBHYOID DERMOID CYST.. A case of this rare and odd affection is reported in the *Revue Mensuelle des Maladies de l'Enfance,* by M. Desgouttes. It seems unusual and interesting enough to merit a rather extended notice, says *Pediatrics.* The case occurred in a boy of 14 years. The father died after an operation for stone in the bladder. The mother and a brother, the only other members of the family, were in good health. The patient himself had never been sick. The present affection was noticed a year and a half ago, when a small, indolent swelling was observed in the anterior part of the right lateral subhyoid region. For 15 months the affection remained stationary, then began again to increase in size, without, however, departing from its original site. This caused his seeking medical advice.

On admission to hospital the tumor was found to occupy the region described above. It was elongated with long axis parallel to the lower jaw, and lay midway between the jaw and the os hyoides. It appeared as large as a small egg. The superficial coverings were unaltered and non-adherent. On palpation it was found soft, regular and fluctuating. When the patient swallowed the tumor became harder and more prominent, appearing to divide itself into two parts separated by a furrow, the furrow corresponding pretty closely to the submaxillary gland. In front it extended to the frenum of the tongue, the frenum being a little displaced to the left, but evidently not having any connection with the tumor. The adjacent mucous membrane was not altered in color or nutrition. The consistence of the growth was homogeneously soft; there was no functional trouble. The diagnosis of ranula was made. In operating they made an incision parallel to the ramus of the jaw. The submaxillary (salivary) gland was laid bare and appeared normal. The mylo-hyoid ligament was incised in front, revealing a tumor with smooth, white walls,

easily recognized as a dermoid cyst. The growth had no pedicle nor any bony attachment. It had the shape of an egg and was full of soft sebaceous matter. The sutures were removed in eight days, and the patient went home later, cured.

Dr. Desgouttes remarks that only five or six such cases have been previously reported, all also operated upon under a mistaken diagnosis. He thinks the mode of surgical approach described by himself the best for these cases, where the size of the tumor would make an intraoral incision impracticable.

PECULIAR CASE OF RESORPTION. By Louis Jack, D.D.S., Philadelphia. Read before the Philadelphia Academy of Stomatology. In the mouth of a woman of middle age the gingiva of a central incisor on the lingual aspect, and extending between this tooth and the lateral incisor, appeared inflamed, but without diffusion. This tissue was not patulous, as when salivary calculus exists, but was firm and slightly swollen, so that it extended somewhat lower on the lingual surface of the enamel than normal. This condition of the margin of the gum to a less extent had existed for at least a year. At the first observation it was supposed to have been caused by imperfect cleansing of the part. After instruction of the patient, as there was but little improvement of the condition, it was referred to impairment of nutrition associated with a marked gouty diathesis. On other occasions I had observed with gouty patients this peculiar state of the gingiva.

Subsequent exploration beneath the altered gingiva revealed a cavity supposed to be carious. After forcing the gum away by the expansion of a cotton pledget the cavity became sufficiently apparent to secure a careful examination, which proved it to be surprisingly deep, with a surface hard throughout and of extreme sensitivity. That this cavity had been produced by resorption of the cementum and dentin could be the only conclusion. The situation was nearly on the central portion of the lingual aspect, extending in the apical direction four millimeters, transversely three and a half millimeters, with a depth of two millimeters. A considerable bay extended under the enamel of the basilar ridge. This projecting enamel was broken down to improve access.

Treatment. A speculum of copper was formed to correspond with the opening in the gum, which extended laterally somewhat beyond

the cavity. This was so shaped that a ligature would bring it into apposition with the root at the sides and apical end of the resorbed area. After arresting the bleeding with adrenalin, followed by alcohol and warmed air, the cavity was filled with Archite cement, which was trimmed to conform with the root. When it is considered that the root of this central was about five millimeters in the antero-posterior direction, the depth of this resorption endangered the pulp. It was nearly if not entirely exposed, as will directly be shown by the thermal reaction of that organ. On the first day of treatment the temperature rate of the tooth was —66°+116° F. At the same time the normal rate proved to be —58° +130°, a range of tolerance of 72°. The tooth was also slightly intolerant of percussion and impatient of the passage of silk, these conditions being usually associated with thermal irritation of the pulp by heat so much above the normal as is shown here. The tone of color was a little deeper and duller than that of the other central, which is not uncommon in pulp disturbance. The bottom of the cavity had been capped with a celluloid disk covered with a paste composed of zinc oxid and eugenol. The case at first was placed under observation each forty-eight hours, when application to the gum surface on the outer aspect above the tooth of tr. aconitum rad., and chloroform, aa, was made for twelve seconds at each interview.

TEMPERATURE TABLE OF CASE.

	Normal rate.	Range of tolerance.
January 30	—58°+130° F.	72°
January 30	—66°+116° F.	50°
February 5	—68°+118° F.	50°
February 7	+120° F.	
February 10	—70°+123° F.	53°
February 14	—64°+124° F.	60°
Tone of color improved.		
February 18	—64°+126° F.	62°
February 21	—63°+128° F.	65°
February 24	—60°+130° F.	70°
Impatience to percussion much less.		

It will be observed that the range of tolerance steadily increased until it nearly reached that of the sound teeth.

The inflamed portion of the gingiva had been somewhat relieved

by krameria diluted with water containing one grain to each ounce of zinc chlorid. In about a month after the discharge of the case the Archite filling was found to be loose, when it was replaced with amalgam without further reaction of the pulp.—*International.*

RETAINING PARTIAL DENTURES. By E. M. Cook, D.D.S., Toledo, O. For many years the dental profession has realized that the old method of retaining partial dentures in position by the use of gold clasps had many very serious disadvantages, the most disastrous being the large number of teeth lost on account of their use. Many methods have been advocated to overcome this difficulty. After the crowning of teeth with gold was introduced it was not an uncommon practice to crown one or more teeth with gold, fitting the bands to these crowned teeth, and this plan has advantages over some of the attachments which have been recommended in recent years. The method I have adopted is the outcome of my practical experience with many methods advanced which I found inadequate, making it necessary to abandon their use.

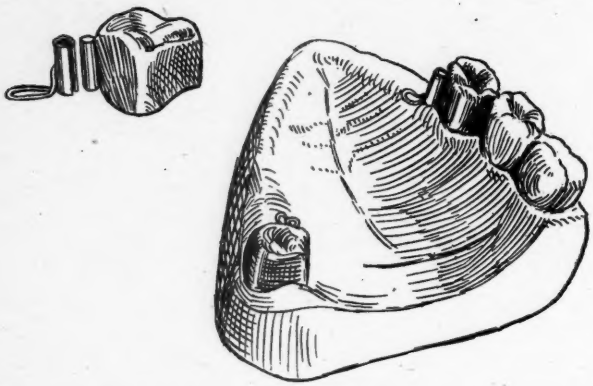
What are the requirements of a fixture for this purpose? First. That it be so constructed that it does not interfere with the usefulness of the tooth to which it is attached. Second. That the pressure of the piece be entirely on the alveolar ridge. Third. That it be easily adjusted to a correct position by the patient.

It does not require much to keep a partial denture in position. If this fixture is properly adjusted it will be of the utmost advantage to the patient; many heretofore hopeless cases having been made useful and comfortable to the wearer. The illustration shows a sample case, the second molar in position on the right, the first and second on the left; all the anterior teeth having been lost.

A crown of not less than 28 gauge is fitted to the right second and to the left first molar, in the usual manner. A piece of iridioplatinum wire 12 gauge is taken, of sufficient length to extend from the margin of the gum to the occlusal surface of the crown, and a piece of 26 gauge clasp metal is formed into a tube that fits the wire closely; sufficient space being left to admit the passing of a piece of 26 gauge metal. Take the pin in a strong pair of pliers or a vise, slit the end through the center, one-fourth the length of wire, take a piece of 26 gauge clasp metal the length of the pin, cut a notch in it the width of the pin, three-fourths its length, so the notch in the clasp

metal will fit in the groove you have cut across the end of the pin. This will give you the clasp metal running along the center of the length of the pin; the two are then soldered together, using only sufficient solder to make the union perfect; too much makes it necessary to cut it away before it can be introduced into the tube.

You now have the tube and pin, to which is soldered the wing of clasp metal, complete; the pin should pass through the tube singly, but not tight, the wing extending through the groove in the tube. Put crowns in position and take an impression, run the model of any



investing material, separate carefully that the crowns may not be disturbed.

It will be necessary to use a guide to set the pins, either a Condit or a Griswold will do, fasten a tube on the end of the guide posts that will admit the pin. The use of the wing of clasp metal on the pin is for the purpose of holding the pin away from the crown the thickness of the tube, and also to make it easier to fit the bell of the crown. When the wing on the pin has been fitted to the crown with the guide in position, solder it to place, not so far inside as to make an obstruction to the tongue, nor so far out as to interfere with the attachment of the teeth. Once more place crowns in position, take an impression and make a model upon which to build the case.

If a metal plate is to be made, the plate should be in position when the impression is taken; after securing the model, the tube is slipped over the pin now attached to the crown. If rubber is used some lugs, of sufficient strength to give a firm attachment in the rubber, should

be soldered to the tube, then proceed in the usual way to construct the case.

In fitting the piece to the mouth I have found it advisable to slip it in position, while the cement is still soft under the crowns, letting it remain for a day or two before removing it. However, this is not necessary, as the piece can easily be taken out, after the cement has set.

To be successful the pins must be parallel on the crowns. With a little practice you will find this a simple attachment, easily made.

It is usually better to have an attachment on each side of the mouth, but I have several cases doing good service where the attachment is to one tooth only.

It is impossible to divide the pressure between the tissues of the mouth and the fixtures, though we are often told that this is accomplished. With this attachment, if the tissue recedes the fixture permits the piece to follow it, always fitting the mouth. My experience with capped tubes and glove-button attachments has not been satisfactory, and I repeat that it is because it is impossible to successfully divide the pressure of a denture, under the power applied in mastication, between the fixture and the tissues of the mouth; one or the other *must* bear the strain.

The cases which indicate this method of construction will doubtless be apparent; however, I will mention a few: A patient presented, who had lost all the inferior teeth posterior to the right lateral incisor; from the region of the second bicuspid there was a muscular adhesion which extended to the center of the alveolar ridge, making it impossible to go back of the second bicuspid with a plate; the teeth on the left side were all in position. I crowned the second bicuspid, swaged a gold plate that extended back as far as the third molar, put attachment on crown, built the piece, the one attachment holding it perfectly.

Another patient had lost the upper left central and lateral incisors, teeth prominent and long. I crowned the first molar on left, and second bicuspid on right, making a narrow gold plate, the patient having as perfect use of the plate as of a bridge, and the appearance was in every way more artistic.

Another class of cases which I have found difficult has been where the molars have been lost on one or both sides below, also a case where first, second and third right inferior molars were lost. I

crowned the second bicuspid, placing two attachments on it, and restored the lost teeth. This piece has been worn a year and a half with great comfort.

A number of my professional friends are using this attachment, and the more they see of it the better they think of it. There is no graft of office rights and royalties connected with the use of it. It is free to all. You can make it yourself. If you try this method and get good results for your patients I shall feel repaid. If any part of my description fails to be perfectly clear, I shall be glad to answer questions at any time.—*Summary.*

IMPROVEMENT IN INTERDENTAL SPLINTS. By W. A. Montell, D.D.S., Baltimore. Essig, in the "American Text-book of Prosthetic Dentistry," says: "Interdental splints in conjunction with submental compresses and occipito-mental bandages have been used by surgeons in the treatment of fractured jaws since 1780." But in spite of their antiquity the writer has been surprised to find how few medical practitioners, even among surgeons, are familiar with their construction, and how few avail themselves of their manifold and manifest advantages. This must be due to no other cause than the fact that, not being in close proximity to members of the dental profession, they make use of such appliances as come to hand most conveniently for immediate treatment.

The advantages of the interdental splint in cases of fracture of the inferior maxilla are almost too numerous to mention, and it would be needless in this assembly, where it is so well understood and appreciated, to enter upon a description of its merits; but in the hope that a commendation of it may be seen by some general practitioner, and that he may give the subject more favorable consideration than in the past, let us here review them for a moment: (1) Perfect readjustment of the fractured parts with absolute rigidity after placing in position, being held so securely after application of the splint that not the slightest crepitation can be observed. (2) Cleanliness of the oral cavity, with full and free access for antiseptic treatment of the wound, if compound fracture. (3) Comfort to the patient by reason of the ease of application and firmness with which it is held in position, yet permitting the natural mobility of the mandible, not confining the patient to liquid food, but enabling him to partake of solids with a very fair ability to

masticate the same, the pictures herewith [exhibiting] showing that there can be obtained at least an inch and one-quarter space between the splint and the upper teeth; and last, but not least, the fact that owing to the advantages already enumerated the resolution and union of the parts can be accomplished in a time much shorter than by the usual surgical appliances for the purpose; the writer's experience in five cases giving from twenty-seven to thirty days as the time necessary to retain the splint *in situ*, with the assurance that unless some complication arise the patient will require but little attention beyond the treatment of the oral cavity with antiseptic washes. These are but the more salient advantages to be obtained, but they should of themselves constitute sufficient cause for the more universal adoption of the interdental splint in fractures of the mandible.

The last case presenting to the writer for treatment was that of a colored man, aged thirty-six, who was struck by another in the jaw, fracturing the mandible just anterior to the ramus of the jaw on the left side, the fracture being compound, the mass of bone being broken completely between the second and third molars. The splint was constructed and applied after the lapse of forty-eight hours, and twenty-nine days later was removed and the patient dismissed with apparently perfect union of the parts.

The method of taking the impression was for the operator to adjust the parts with the fingers of both hands, and while retaining them thus in position, for the assistant, holding a towel previously folded into a square of eight or ten inches, filled with plaster, and covered with a sheet of tissue paper to prevent sticking, to take a plaster impression of the external surface of the chin and jaw. After the setting of the plaster and its removal from position, it is once more applied to place, the parts again adjusted to their natural position, and then, with a suitable impression tray with softened modeling compound, an impression is taken of the teeth, the pressure of the tray containing the wax forcing the jaw into the mold already taken of its external surface, thus giving an accurate mold of the teeth and their proper alignment without the necessity of cutting the plaster model and readjusting to position.

From the mold of the external surface of the jaw a model of the jaw in its normal position is then obtained, and upon this is constructed a vulcanite cover for the entire mandible, cutting out such

portions as approach the throat and would interfere in the slightest degree with deglutition. This external splint was found too large for the ordinary vulcanizer, and was made in two pieces, afterward being riveted to the cross-bar through which the wires pass. By the use of this external splint not only is there obtained an absolute rigidity of the parts, but, the support being extended posteriorly to the ramus of the jaw, the jaw is firmly held longitudinally as well as vertically, thus avoiding any possible chance of displacement.

In its construction the internal splint should not extend downward upon the crowns of the teeth more than one-half their depths, thus affording full opportunity to observe the case and the lacerated tissue, if any, in the oral cavity.

The only difficulty the writer encountered in the case was due to the closing up of the external tissue, some slight soreness and excoriation occurring on the twentieth day, which having been anticipated gave but little annoyance, three dustings with Squibb's compound alum powder (consisting of burnt alum, camphor and carbolic acid) sufficing to allay the discomfort; and upon the removal of the splint on the twenty-ninth day the wound was thoroughly dry and healed.—*Cosmos.*

EXPERIMENTS IN PLASTER OF PARIS TO TEST EXPANSIONS. By Dr. Stewart J. Spence, Harriman, Tenn. Observe that our caption says expansions, not expansion. They are three. The first occurs during crystallization; the second during the twenty-four hours following crystallization, and is due possibly to the absorption of something from the atmosphere; the third takes place during vulcanization and is due to steam.

According to the *Encyclopedia Britannica,* plaster of paris is obtained by desiccation from the hydrated sulphate of lime, commercially known as gypsum, an earth found especially in the deposits of the Tertiary period. At 175 degrees F. the gypsum begins to part with its combined water; at from 230 to 250 degrees the best results are obtained, the resulting plaster acquiring the valuable property of recombining with water and setting in the act; but at 480 degrees and upwards this property is lost. The phenomenon of setting *"is accompanied with some expansion and the evolution of heat."*

Differences in Plaster of Paris.—The plasters supplied by different manufacturers differ in their degrees of expansion. A year or two

ago the writer obtained samples of plaster from seven different dealers in dentists' supplies, and found that the expansion of the most expansive was about double that of the least so, while the other five ranged in varying degrees between these two. In hardness they appeared to differ but little. My experiments have been for the most part made with this least expansive plaster, a barrel of which I obtained from the Newark Lime and Cement Manufacturing Co. of Newark, N. J. In quality it is known as "dental plaster," and its expansion, when mixed most favorably for reducing expansion, is 0.55 millimeter in three inches. Since then I have tested several other brands, but none of them shows less expansion than this, except the "impression" and "casting" plasters of the S. S. White Co., the former of which gives 0.42 millimeter as its expansion in three inches, and the latter 0.37 mill. [A CORRECTION.—In my article in the September DIGEST, "Experiments With Modeling Composition," instead of "the expansion of the least expansive kinds of plaster of paris is not less than 0.35 millimeters in two inches," read, in three inches.]

Methods of Experimentation.—These experiments to test expansion were made in three ways—(1) by pouring plaster into the lid of one of the metal boxes in which vulcanizable rubber comes to us; (2) by pouring plaster into an ordinary upper impression tray, and (3) by a scissors-like instrument which I will term "expanders." As the first of these three methods afforded no very exact means of measuring the expansion, it was early abandoned. The second permits fairly exact measurements by admitting narrow strips of tinfoil in the space between the plaster and tray at the dome of the palatal portion, as many strips as can be easily withdrawn when the tray is resting on the bench and a moderate pressure applied to the cast being reckoned as the measure of expansion. As, however, all casts made in impression cups are liable to warpage, because the flanges oppose free lateral expansion of the setting plaster, and so force it upward at the palatal dome (as explained in my article, "Experiments in Plaster to Test Warpage," in the June DIGEST), therefore I made the previously mentioned expanders, by which I think I obtained the exact measurement of lateral expansion. In the cut *b* represents a hinge; *a a* are two spurs projecting about three-quarters of an inch at right angles from the blades of the instrument, and designed to be sunk into a strip of plaster mix after it has been

poured upon a board, and *c c* are the points which indicate by their outward movement during crystallization the degree of the expansion. As the distance from the spurs to the joint is one-fourth the distance from the joint to the points, therefore the extent to which the points move apart during crystallization gives, when divided by four, the measure of expansion in three inches, which latter is the width apart at which the spurs are sunk in the plaster. The instrument is about ten inches long. Any dentist can make one in a half-hour.

In making tests by the tray method the personal equation of the experimenter enters somewhat into the calculation, but those made by the expanders seem to scarcely admit an error, and are very uniform in results. By the tray method the experimenter is liable to be deceived because the expanded plaster does not always show a space until the cast has been removed from the tray and replaced. The cause of this may be that the plaster forces outward the flanges of the tray. Again, if the cast on being replaced in the tray is held so that the thumb and finger press the cast and tray together at the palatal dome, the bending of the tray while thus held may obliterate the space. Let me give as illustrations of this matter of personal equation in this respect the fact that two parties with whom I have corresponded on this subject each declared by letter that their tests by tray of certain plasters which they mentioned showed no expansion, while to me the expansions were quite apparent. One of these was a prominent dentist, and the other a man in a well-known dental supply house. The dentist wrote that the expansion of his cast was almost nil, "certainly not more than one thickness of No. 6 tinfoil." But on testing said plaster I found the expansion to be, even when mixed so as to give least expansion, no less than ten thicknesses of No. 20 tinfoil by the tray method and about 0.55 millimeter in three inches by the expanders. The man in the dental supply house sent me a cast poured in an impression cup, together with the cup, remarking that I would observe the adaptation of plaster to tray to be "thoroughly perfect." But, alas, I found, on the contrary, a space between cast and tray which I could observe at a distance of twelve feet, and into which I could insert thirteen thicknesses of No. 20 tinfoil!

Not only do different plasters expand in differing degrees, but *the same plaster expands very differently according to the stirring*

given it before pouring. In one experiment I made two casts, which I shall call Nos. 1 and 2, one of which expanded two and one-half times more than the other, from no other cause than longer stirring. All other conditions were alike. The temperature of the water was 75 degrees F., that of the plaster 77 degrees, and in each case the water and plaster were measured out. Cast No. 1 was stirred as little as possible, the entire time of mixing occupying only ten seconds; it set in ten minutes; its temperature (as shown by thermometer with bulb laid on cast) continued to rise for twenty minutes longer, and reached 96 degrees. The primary expansion (which was then completed) admitted twelve thicknesses of No. 20 tinfoil between tray and cast. Cast No. 2 was stirred one and one-half minutes; it set in one and one-half minutes more; in four and a half minutes longer its temperature reached 107 degrees, and its expansion then admitted twenty-eight thicknesses of No. 20 tinfoil. From this we see that *long stirring of plaster of paris hastens setting and increases heat and expansion.*

When I entered the ranks of dentistry about twenty-five years ago the accepted doctrine, as voiced in the text-books, was that long stirring was the correct thing; that it rendered casts tough and hard. Nothing was said of expansion. Some experiments which I made and published in the *Cosmos* of November, 1883 (and which were later incorporated in Prof. Richardson's "Mechanical Dentistry"), exposed the error of this doctrine and showed that long stirring vastly increases expansion without adding hardness.

The expanders pointed out to me the fact that *the primary expansion proceeds only during the period in which the heat of the crystallizing cast is rising.* Thus it is complete in from five to thirty minutes.

Another interesting phenomenon was made to appear by the expanders. They showed that there occurs a second expansion, proceeding gradually for about twenty-four hours and amounting to about one-fourth or one-fifth that of the first expansion. To illustrate these two facts let me copy two items from my notes: *a.* Plain plaster of paris; short stirring; set in thirteen minutes; expansion commenced before set; expansion reached 0.7 mill. in thirty minutes; in twenty-four hours expansion had increased about 0.06 millimeter. No further increase in three days. *b.* Plain plaster of paris; stirred two minutes; set in one minute more; expansion

commenced before set; heat and expansion over in fifteen minutes more, showing 1.6 mill. of expansion. In thirty-four hours expansion had increased 0.4 mill., making total expansion 2.0 millimeters. As previously explained, these expansions were those of three inches of plaster and were measured by the expanders. Thus we see that both long stirring and short stirring of plaster gave this second expansion.

Second Expansion of Plaster of Paris.—From this fact of a second expansion we learn that some little may be gained by pouring the model on the day on which the impression (if of plaster) is taken. We also learn that it is almost impossible to get ahead of the first expansion of the plaster impression by hastily pouring the model. And from the fact that long stirring increases expansion, we learn that such mixing should never be employed in forming either impression or model of plaster of paris; that if a stiff impression mix is desired in order to compress soft gums while taking the impression, it is better to obtain it by waiting patiently with tray and mix in hand until it begins to set. (Personally the writer has altogether abandoned the ordinary plaster for impressions, and uses either modeling composition, because of its contraction, or plaster of his own compounding, which has the three desirable qualities of non-expansion, softness when set and quickness of setting. The present paper is devoted only to the study of the phenomena of the common plaster of paris.)

Third Expansion of Plaster of Paris.—But there is a *third expansion of plaster of paris.* When the writer over a year ago was experimenting with a method for preventing the expansion of plaster, and had succeeded in eliminating the first and second expansions, he was surprised to find that results were still not altogether what he had expected, and in searching for a cause of failure it occurred to to him to suspect the influence of the vulcanizer on the model. Therefore a number of old casts which had been run in impression trays, some of treated plaster and others of plain, were placed in the vulcanizer naked (i. e., not invested, as is a model in flask) and subjected to a bath of 320 degrees F. for sixty minutes. The result was most astonishing; they all came out badly swollen! This, their *third* expansion, was about equal to that of both their previous expansions together. Even the treated casts, which had shown no previous expansion, were now swollen. Here appeared a fertile source

of ill-fitting vulcanite plates! Two of the casts were our old friends, Nos. 1 and 2, but sadly changed. They had gone through the vulcanizer. No. 1 now showed almost as much expansion as did No. 2 before their immersion, and No. 2 had become bloated to beyond twice its previous expansion. *This proves that plaster of paris casts expand in the process of vulcanization.*

In a number of instances I have subjected a cast to repeated passages through the vulcanizer, and have found each immersion to increase its bulk, until after four or five repetitions of the ordeal (by which time they became past going) the space between tray and plaster has reached the enormous extent of a twelfth of an inch! This seems to speak unfavorably for long vulcanization. How far the lesser heat would counteract the longer time I have not tested by experiment, but am under the impression that the two or three years in which I vulcanized at low heat for four hours were those in which I had the largest percentage of ill-fitting plates.

On discovering that heated water causes expansion of plaster of paris casts I tried reducing the quantity of water, at first placing only a spoonful in the vulcanizer, and afterwards none at all. In this latter case I relied on the water held in the plaster to provide sufficient steam. In neither case was the result favorable. The casts still expanded, and with little diminution. A thorough drying of the plaster was found to prevent expansion and even to produce concentration. Thus it was demonstrated that this third expansion of plaster is caused by steam. But experience soon proved that to dry filled flasks and then vulcanize rubber in them is a long and troublesome process. The heat will not pass 212 degrees F. until all the steam has passed off, which requires over an hour, and then it suddenly shoots up in a way difficult to control. I tried this method for some months, ruining several plates thereby, and was very glad when I had succeeded in so doctoring my plaster as to overcome its expansion in steam and thus allow me to return to wet heat for vulcanizing.

On discovering that my casts expanded in the vulcanizer, it occurred to me that this expansion, though so much in evidence with naked casts, might possibly be prevented by the pressure of surrounding rubber in cases invested in the flask. To test this matter, plaster of paris was poured into an impression tray, thus producing a model, which was covered with sheet wax and invested in a flask,

exactly as is done in making rubber plates, except in omitting the teeth. After being vulcanized this plaster model was carefully removed from the rubber plate and returned to its place in the tray. But it refused to fit back into this matrix, *showing nearly as much expansion as the previously tested naked casts had shown.* Though this seemed conclusive, for I could see no room for error, yet "to make assurance doubly sure" I repeated the experiment substantially in the same manner, and obtained a similar result. *Thus it was proven that a plaster model is so forcibly expanded by the action of steam during vulcanization that it overcomes the resistance to expansion offered by the vulcanizing rubber, and swells.*

Therefore the dentist who uses plaster of paris for models has to contend with three expansions in his model, and if his impression was of plaster, with at least one expansion in it, besides the warpages of both impression and model, which, as I showed in a previous paper, occur from restricted lateral expansion. No wonder so many vulcanite plates are misfits!—*Items.*

VALUE OF CATAPHORESIS. By Louis Jack, D. D. S., Philadelphia. Read before the Philadelphia Academy of Stomatology, March 25, 1902. When this subject was proposed at a previous meeting of this Academy, it was for the purpose of having the subject discussed in order to show the class of cases where cataphoric action is not required for the relief of dentinal sensitivity, and to determine where it is demanded. A further motive held in view is to promote the wider use of this beneficent means of relieving exquisite pain.

Before opening the subject in its practical relations, a summary or historical statement concerning the electrical diffusion of medicaments may be of interest. The first investigator in this direction was Dr. B. W. Richardson, of London, who published two articles on Voltaic Narcotism in 1859. His experiments were conducted with aconite in combination with chloroform. With the aid of this combination he performed a series of successful operations, among them the extraction of five teeth. Here he applied a fine wire anode placed around the teeth and wound with cotton soaked in the above mixture, complete anesthesia taking place in five minutes. Richardson met with intense opposition on the part of his medical *confréres,* for various reasons. He subsequently abandoned further experi-

mentation, the development of general anesthesia probably removing the incentive for further pursuit. The subject remained dormant for over twenty-five years, when it was revived by Wagner, in 1886. Reynolds commenced to use cocain in this way in 1887. Peterson began a series of interesting and conclusive experiments in 1888. In its application to dentistry the first published paper to appear was by B. F. McGrath in 1888. Westlake read a paper before the New York State Dental Society in 1892, he claiming successful applications. In 1895 Dr. Gillette presented before the American Dental Association an article containing explicit directions with relation to satisfactory experiments and description of operations, which enlisted immediate and general attention to the subject. It must be held that by his efforts this method of treatment was placed on a reliable basis. Subsequently in various papers Dr. Price has demonstrated the scientific elements of this interesting procedure.

My experiments commenced in the early part of 1896, in which I followed the methods as disclosed by Dr. Gillette, but with a different apparatus. From that time to the present it has been in my hands a most reliable and certain means of giving relief in acute dentinal sensitivity. During this period I have administered this means over two hundred and sixty times, mostly in acute conditions. The result has been satisfactory, which I largely attribute to the apparatus I have employed, namely, the dry cell chlorid of silver battery, with an ampèremeter to measure the current strength, and the Willms controller to regulate the pressure to the varying degree of electric irritation presented.

The controller I first had in use was of one hundred thousand ohms at its greatest resistance. This was found in many cases to be insufficient. On the substitution of one of nominally four hundred thousand ohms the management of cases became extremely satisfactory. This individual controller, on being tested by Mr. Schramm, of the University of Pennsylvania, showed, at 70 degrees F., at the first contact point a resistance of five hundred and eighty-nine thousand ohms. This degree of resistance with fifteen volts pressure is not extreme, as in a couple of cases of persons very susceptible to electrical irritation slight shock was manifest at the first contact point. The apparatus here shown has been in use since April of 1896 without replenishment of the batteries or any repairs.

The cases where there is no need for the use of cataphoresis, as

I would define them, are those of subacute sensitivity, when carbolic acid in combination with oil of cloves or caustic potash, or desiccation by heated air, will give relief. There are, however, many instances when sensitivity is so extreme that none of these means furnishes more than slight benefit. These compose the class of cases where, to excavate and shape the cavities, zinc chlorid or general anesthesia would be required. Zinc chlorid generally is painful, is applicable only to shallow cavities, and should not be applied to the front teeth under any circumstances. Anesthesia by ether is troublesome and questionable, except the person is sufficiently intelligent and sensible; therefore, when the permanent treatment of caries is necessary, there is in my judgment no choice in the class under consideration outside of cataphoresis.

There are few persons who can in extreme sensitivity of dentin permit the careful preparation of cavities even after the slight modification which may be effected by the escharotics or by desiccation. These do not act deeply enough to be sufficiently effective. It should be borne in mind that as an accompaniment of extreme dentinal sensitivity there nearly always exists high nervous irritability, which interdicts the infliction of pain. Here the simple requirements of human sympathy necessitate the avoidance of the consequences of operating without profound local anesthesia.

The condition of the tooth after complete anesthesia by cocain cataphoresis enables the formation of the cavity to proceed without hindrance, and, except inconvenience of the situation may occur, the patient offers no resistance to the pursuit of the requirements of the case in hand. Furthermore, the nervous system of the patient escapes the strain otherwise imparted. The effect of subjecting some persons to acute dental pain occasions shock, not apparent at the moment, but afterwards it becomes manifest by the depression which follows the suffering.

It must be considered that too large a proportion of operative procedures are inefficiently carried out because of the inability of the patient to endure proper extension of the cutting and the formation necessary to secure sufficient retention. In some connection with this consideration is the effect produced upon the nervous force of the operator who endeavors to carry out these requirements without using the most efficient means of subduing acute sensitivity.

The objection has frequently been made of the time required to

secure anesthesia in this manner. This loss is more apparent than real, as in the instances where cataphoric action is required there is a real gain of time secured by the completion of the cases; whereas, with inefficient obtundation temporary fillings have to be inserted, thus indefinitely deferring permanent treatment.

Fortunately for operator and patient, the proportion of cases of acute dentinal sensitivity is small in comparison with those causing slight and moderate pain, but in my view, and from the results following cataphoresis, I have no question concerning the benefit in every respect following its use.

For the reasons herein given I am disposed to urge upon my colleagues to consider the subject anew, that the results of this benign mode of treatment may be further extended.—*International.*

AMPUTATION OF THE PALATAL ROOTS OF SUPERIOR FIRST MOLARS FOR THE PREVENTION OF ANTRAL ABSCESSES. By Isidore Lett, D. D. S., Boston, Mass. Read before the American Academy of Dental Science, May 7, 1902. One of the disagreeable cases which dentists are called upon to treat surgically is a purulent secretion in the antrum of Highmore. These conditions are frequently met with, and whereas formerly most cases were sent to general surgeons, now it is the work for advanced dentists. You all being familiar with the anatomy of the maxillary bones and antrum, I will proceed to give details of a treatment for preventing an antral abscess, caused by mephitic gases from a putrescent pulp passing through the apical foramen of palatal roots of superior first and second molar teeth which perforate the wall of the antrum. There has been very little written on this subject, if at all. It is not an uncommon occurrence in cleansing out the palatal root to be able to pass the probe through the apical foramen into the antrum. In cases in which the pulp had been devitalized by the dentist, or from other causes, before putrefaction has caused the mephitic gases to pass into the antrum, I should certainly not amputate such a root, but simply treat it as any ordinary case, but when it is a case of an old putrescent pulp, an enlarged apical foramen, allowing a small broach to pass easily through it, I should recommend the amputation of such a root. The palatal roots of second molars have been found to perforate the wall of the antrum. Personally, I have not met with such a case. It is ad-

visable, when we find on examination a putrescent pulp in a first or second molar, to probe very carefully into the palatal root, for it may happen to be one of those cases previously described, and if we were to pass the broach up carelessly we would possibly force some septic matter directly into the antrum. I usually begin by opening the buccal roots and disinfecting them, then proceed on the palatal root by first opening the mouth of the canal with a rose bur, then approaching the apex by frequently and carefully removing the deleterious matter with the broach and syringe. If the apical foramen is of normal size I leave it alone, but should the broach pass through I probe to ascertain if there is an opening through into the antrum.

I will now give you the results of three operations, two being successful, and one, quite complicated, a failure. In the fall of 1897 a patient was sent to me to have a bridge for the superior right side. The two bicuspids and second and third molars had been extracted. The first molar was badly decayed and contained a putrescent pulp. After cleansing out the cavity and pulp-chamber I opened the buccal roots and then the palatal. The broach passed through the apical foramen into the antrum. On withdrawal of the broach I found a thick, creamy, purulent substance closely resembling pus. The amount was too small to pass judgment on. I opened the apical foramen so as to admit the broach with a little cotton twisted on the end. This had more of that substance, which had a decided disagreeable odor, and was probably pus. Having only this tooth to depend upon for the bridge, something desperate had to be done, to try and save the molar. Amputation of the root suggested itself, and I proceeded at once to perform the operation. As before stated, all the root-canals having been opened, I disinfected and filled the two buccal roots, gutta-percha being used for root-filling. The mouth of the palatal canal being previously enlarged, I cleansed, dried, and sealed it with a pellet of temporary stopping. With a large wheel bur I cut a circular groove around the interior of the root below the bifurcation, and followed this up with a small fissure bur in a right angle attachment, until the root was separated from the crown. Before removing the root cotton was packed into the fissure to prevent the blood from oozing into the crown cavity, also to act as a wall to allow the amalgam to be firmly packed and make a serviceable filling. The removal of the root was accomplished by making a

vertical incision through the soft tissues from about the middle of the length of the root to the free margin of the gum. After gently forcing the tissues back, the alveolar process was removed with the engine, giving a good exposure. Then introducing a flat-bladed elevator into the fissure (the cotton having been removed), and pressing downward, the amputated end was forced out sufficiently to be grasped and removed with a pair of small forceps. The opening into the antrum was enlarged and a fifty per cent solution of phenol-sodique was used to wash the antrum. I kept the treatment up for several weeks and then removed the packing and allowed the alveolus to fill with granulations from the floor of the antrum up, by decreasing the size of the gauze dressing at each visit. Should the dressing be discontinued immediately after the last washing out of the antrum, the granulations will not be as firm and solid. I saw this case frequently for three months, then lost all trace of it. The tooth was apparently as solid as it ever had been.

Another case was as successfully treated as the previous one, with the exception that the antrum was syringed out only once and granulations allowed to close the sinus.

There is always some particular case which will not give us the desired satisfactory results. An operation or experiment should not be discouraged or condemned because of failure of the first case. The failure may be due to some abnormal condition, such as malformation and fused roots, or a poor physical condition, anemia, or the presence of some specific disease, congenital or acquired, such as scrofulosis or syphilis. Under those conditions I should advise abandoning the operation. A dentist should always take into consideration the physical and mental condition of a patient. If it is not satisfactory to him a course of treatment should be suggested either by him, or, preferably, by the patient's physician, to bring up the vitality. I had a very interesting and complicated case several months ago, with unsatisfactory results.

Mr. A., about twenty-eight years of age, presented, complaining of severe pain in the superior right maxillary bone, and soreness over the first and third molar teeth. (The second molar had been extracted early in life, allowing the third molar to occupy its former place.) Periodontitis was evident in both molars. It was much more severe in the third molar, which had a large cement filling over a capped pulp. The pulp capping was unsuccessful. The

crown resembled a bicuspid in shape and size. It was impossible to open the canals. I advised extraction, which was done. The roots were solidly fused together, having the appearance of a single thick root. The apex had been slightly broken down by caries. The next day the patient returned with no pain in the region of the third molar, but, as he expressed it, "the symptoms had moved from the extracted tooth to the other." This molar had been treated and filled some time before. There was very little of the walls remaining. I removed the large filling and opened up the pulp-chamber to the canals. The mesio-buccal canal was normal. The disto-buccal canal could not be opened to the apex. There appeared to be a curve at almost right angles, about an eighth of an inch from the apex. The palatal canal was cleansed out and a probe passed into the antrum. I decided to amputate the palatal root. Should the disto-buccal root give trouble later on, I would open up the alveolar process and trim off the end of that root. With the use of adrenalin and a five per cent solution of cocain I separated the palatal root from the body of the tooth. This was a difficult operation. The root was fused as much as an eighth of an inch from the bifurcation. The pain was quite severe after the root had been detached, so I decided to allow the root to remain until the next day. The patient was discouraged on his return, and demanded the extraction of the tooth. It was impossible to persuade him to allow me to complete the operation, so the tooth was extracted. The disto-buccal root was just as I had diagnosed it. About an eighth of an inch from the apex the root described almost a right angle. I treated the case for a week and discharged it.

An interesting case of caries of the superior maxillary bone, of eighteen years' standing, came under my care about six months ago. The caries extended from almost the median line to just beyond the second bicuspid. The probe almost reached the palatal root of the first molar. The filling had been lost from this molar, and it contained a putrescent pulp. I opened the root-canals and found the palatal root had an enlarged apical foramen and perforated the floor of the antrum. I advised the extraction of this tooth, fearing the carious bone would cause some unlooked-for results.

I have never attempted to treat an infected antrum by amputating the palatal root and using the opening for the introduction of a canula for drainage. The process being soft and cellular, the probabilities are that the pus infiltrates through to such an extent

that removal of the suspected bone would leave the tooth with very little, if any, support.

Occasionally the root of a second bicuspid perforates the wall of the antrum. When putrefaction of the pulp takes place an abscess draining into the antrum is liable to result. In the endeavor to save the tooth I have seen the antrum treated through the tooth. These cases are rarely successful. For a time—weeks, months or several years—the suppuration will stop, then suddenly and unexpectedly the old symptoms return, and when they do they are more difficult to treat, having become chronic.

In 1897 I operated on a case of caries of the right palate bones. The diagnostic signs and symptoms were identical with those which would indicate purulent secretion in the antrum. A youth, seventeen years of age, complained of pain in the region of the superior right maxillary bone, infraorbital neuralgia, and a sense of fulness over the entire region. The teeth appeared to be in good condition. The first molar had a large cement filling. This was removed and a putrescent pulp found. After cleansing out the root-canals I found the two buccal roots normal, but the flexible probe passed through the apex of the palatal root and met with no obstruction for over an inch. My diagnosis was an abscess draining in the antrum. This root diverged abnormally from the buccal ones. For this reason, before giving my diagnosis to the patient, I again passed the probe through the apex and worked it in until I expected to touch the opposite wall of the antrum. Much to my surprise, the patient exclaimed, "Doctor, the instrument is in my nose." I next examined the roof of the mouth. There was no indication of any trouble here, with the exception of a white spot, smaller than the head of a pin, on the right side, between the median line and first molar. It appeared so insignificant I paid no attention to it. At this time I was passing a blunt probe over the roof of the mouth to locate any tenderness, which would help me from a diagnostic point of view. I pressed upon this white spot gently and the probe slipped through into the nose. The palatal root did not perforate the floor of the antrum but pointed towards the nasal cavity. I treated and filled the root-canals and crown. The following day I removed quite a quantity of the palatal and alveolar processes. This was done by making a deep incision from the median line opposite the second bicuspid to the second molar, and another incision from

the median line to the cuspid, making a flap, which was dissected down, exposing the carious bone. This was all curetted out, leaving an opening about the size of a nickel between the nose and mouth. The flap was replaced, and, as it seemed to adapt itself so readily, no mechanical means were taken to retain it in position. The granulation filled in rapidly, with the exception of one point, which was kept open intentionally for drainage and syringing the floor of the nose. In three weeks the entire surface was healed, and in six months new bone filled up the space formerly occupied by the carious bone.

I should like to say a few words about hydrogen dioxid. It never should be used unless there is a large opening to allow it to escape easily. I have no doubt but what considerable damage is done by syringing the dioxid through the apex of a root into tissue, either bone or soft, for exploratory purposes, without having sufficient drainage. A good example of the folly of using it to asepticize the alveolus of a superior central incisor occurred in my first month of practice. The apex was large enough to allow the passage of a very fine broach. I used a small syringe to insert into the root-canal, and when the dioxid passed through the apex into the alveolar process the pain was excruciating and the lip began to swell. In less than five minutes the swelling was as large as a good-sized apple. Fortunately Dr. James E. Garretson was in the next room, and I sent for him. The swelling was still growing larger, until it became half as large as her head. He immediately advised me to open up through the process and drain the parts, which I did. It stopped the pain, but the tumefaction did not disappear for nearly two weeks. Dr. Garretson could assign no cause why the dioxid should cause such an emphysema. It was an inoffensive-looking incisor. I have never used it in a root-canal since, unless there existed another means of drainage. Since then I have heard of many similar cases from other dentists, but no such extensive emphysema.

Just see what a complicated condition would have resulted had that been one of those palatal roots we are discussing, instead of an incisor. Some of the gas eliminated by the action of the hydrogen dioxid on organic matter would have passed into the antrum, possibly carrying some deleterious particles of matter along with it, causing an abscess; surely so if it were one of those

anomalous conditions of the antrum, such as the obliteration of the opening into the middle meatus of the nose, caused by hypertrophy of the bones. So I repeat again, one should be very cautious about syringing dioxid in an antrum through a root-canal unless there is a source of drainage elsewhere.—*International.*

LEUCOPLAKIA.—Frederick C. Cobb (*Boston Med. and Surg. Jour.*), discussing the etiology of this affection, says that of all irritants tobacco is, perhaps, the most effective. Leucoplakia has been called "smoker's paralysis." As to treatment, the evidence is most conflicting. Cases treated by papayotin, by excision, by cautery, and by "let alone," are all credited with successful results. On the other hand, many leucoplakias, in spite of all treatment, end in carcinoma. Butlin recommends soothing alkaline lotions and ointments, with avoidance of the cautery and all irritants, and decrease or abstention from smoking. If the patch, in spite of all these measures, remains stationary, and, above all, if induration or warty growth or any appearance of cancer suggests itself, thorough excision of the patch is advised. Of ten cases occurring in the Massachusetts General Hospital four developed carcinoma.

TEACHING OF COMMON DISEASES.—It has been said, and with some reason, that an average medical student, on graduation, is far better prepared to treat diseases and conditions he is never or rarely likely to see than those of common occurrence. He has probably seen much of major surgery, and is well informed regarding typhoid fever and diseases of the blood, but when he is brought face to face with a cold or a backache or any of the thousand and one minor ills of life, he is far less a master of the situation. It would be a poor policy to neglect the rarer affections for the sake of the commonplace, but it is almost equally unfortunate and far more unpractical to ignore the latter in the hope their knowledge of them may somehow come in later life. The fact apparently is that the instruction given is apt to concern itself chiefly with disease in its unusual manifestations. Interesting cases predominate. We rarely hear of a clinical exercise before a class devoted to the everyday variations from health. A course in common diseases remains to be offered, and our students are suffering in consequence. A remedy is perhaps difficult to find in the wards of a large hospital, where the patients are admitted for various reasons, but certainly not because they are commonplace. The solution lies in the more intelligent and systematic use of out-patient departments, to which each day great numbers come afflicted with the most trivial ailments. If the students could actually study these patients, under the direction of authoritative teachers, they would gain a knowledge which the ordinary clinical lecture is not likely to give. How this may be done is a matter of detail, but for out-patient departments to be used chiefly as opportunities for physical diagnosis, and not for the detailed study of disease as such, is a misfortune which our improved organization should do all in its power to remedy.—*Boston Med. and Surg. Jour.* (How would this apply to dentistry?—Ed.)

Letters.

THE OFFICE BOY HAS ANOTHER GO WITH DOCK KNOWITAL.

(AS TOLD BY THE OFFICE BOY.)

The Boss he was Offul Mad at me on account of what happened to Mis' Watson the Day that student, Dock Knowital, took her impressions. He seemed to think I done all the Mischief. I would of felt Bad about it, only the Boss owes me Twenty-One Dolers Wages, an' besides, I knowed he was glad to be Rid o' Mis' Watson at any Cost. Still, I left on like I was Turrible Concerned, an' says he, kind o' Tonin' Down a little, "Ef it had been some boys, James, I'd of Discharged them, but seein' as you act like you was Penitent, I'll overlook it, this time. In fact I'll give you a chance to square yourself with Dock Knowital. He's comin' to keep office fer me again nex' week, while I go to the State Society meetin'."

So sure enough, a few days later Dock Knowital he Come Again, an' the Boss he took me by the Hand, an' he led me up to where Dock Knowital was readin' the Football column in the paper, an' says he, "Dock, James heer acknowledges he done you Dirt the las' time you staid here, 'cause he was Mad at you, an' so he give you the Hard-Settin' plaster to take them impressions with, a-purpose to git you in Trouble. Now he's Offul Sorry he done it, an' he asts your Forgiveness, an' says he won't never do it no More."

So then I Left On like I was a-cryin', only I kep' my arm up so as to hide my Face, an' the truth was, I was Mad Enough to Fite, only I knowed I'd best Keep Still, an' the Chance would come fer Revenge likely as not. Dock Knowital he looked Offul Solemn, like it wasn't a Thing so easy Overlooked, an' says he, "James don't deserve no consideration from me, an' ef it wasn't fer Dock Contour here he wouldn't git none. As it is I reckon I'll haf to let him off. Nex' time though, he'll haf to stand the consequences of his Doin's, whether er no. An' I warn him I ain't no Angel when I'm mad."

He looked Savage at me, so I cried some more ('cause I was so Dern Mad), an' I said I was sorry I didn't mind better the Things my sunday school Teacher learned me, an' I'd do my best to Reform,

an' thinks I, "You big Putty-Headed Bully, I'll learn you to Pick On a feller under your Size before this Day is ended. You don't Git Off so Easy, this time." So after the Boss had Went, Dock Knowital he told me to Set Down on a chair in the Hall, an' not to Leave It without he told me exceptin' it was to Tend Bell. That made me Bilin' Mad, an' it seemed like he'd got the Best o' me this time sure enough. I set there till noon, never once Gittin' Up, an' when he went out to Lunch I heered him tell Betty, the Boss' kitchen girl, to Watch Out an' tell him ef I moved off the Chair. Betty she's Mad at me, 'cause I writ a Letter to her an' put a Live Cockroach in, so she done the way Dock told her, an' I dastn't move a leg. When Dock come back he made her fetch my Dinner in to me, an' derned ef I got a Chanst so much as to stand up once until nigh about four o'clock, fer there wasn't a Ring at the Bell all that Time.

But at last, jis' when I was thinkin' I'd jump up an' make a Brake, an' Skin Out an' never come back, the bell Rung, sure enough. They was Two People standin' waitin'. One was a Plain Woman, what looked like she'd have a tooth pulled, an' then she'd take an' undo a Corner of her Handkerchief an' take out a Quarter in Nickels, to Pay. The other was a Preacher, I reckon, the way he looked. The woman she was First, an' she looked like she was a Washwoman, an' she took out a Card an' says she, "Hand that to the Doctor, my son"—like I was a Kid. It seemed kind o' Curious, her havin' a Card, so I kind o' Squinted at it, as I was agoin' in to find Dock Knowital. It said, "Mrs. Howard Rowland" on it. I knowed they wasn't only one Howard Rowland in the city, an' he's the Manager of the Standard Oil Company, an' Offul Ritch. Then I remembered heerin' tell how Common Lookin' Mrs. Rowland was, not puttin' on no Airs ner nothin'.

So then I had to think Offul Quick, an' I reckoned from her givin' me her Card to show the Boss, that she didn't know him, ner him her, an' mebbe she didn't even know how the Boss looked. Anyhow, it seemed like a Fair Chance o' Settin' Up some kind o' Job on Dock Knowital, ef I wouldn't let her know nothin' about the Boss bein' away an' him attendin' to the Offis in the Boss' place. So I didn't say nothin' about no Card to Dock Knowital, but I said, "It's a Woman that wants a Tooth Pulled, I reckon, an' you'd best ast her fer the Pay in Advance, an' ef it was me, knowin' the Boss' peculiarities, I'd want to take her out in the Woodshed to do the

Job, 'cause she don't look any too Clean, an' they's a Old Chair he keeps there fer them Kind."

Dock he never paid No Attention to me, so while he was Lightin' his Pipe I went out an' I told the Lady that Dock was Cranky by Spells, an' this was one o' his Wust Days, 'cause he wasn't feelin' so Well, but she mustn't mind, no matter how he Acted, 'cause he was reely Kind Harted an' Sympathizin', only he was Queer. An' they wasn't no other dentist in the City could begin to Tech him when it come to a Fine Job o' Dentistry. In a Minute Dock he come a-shufflin' in the Hall, a-smokin' his Pipe, an' he never even took it out o' his Mouth, but says he, "Whadyewant?"—kind o' Short an' Snappy, like he didn't want to be Disturbed. The lady she seemed kind o' Supprised, in spite o' what I'd jis' told her, an' she looked confused-like, an' she stammered somethin' I couldn't quite Make Out, 'cause I was whisperin' to Dock meanwhile, that they was a Gentleman in the Settin'-Room what had come in First, an' I'd orter thought to tell him before. Then he took his Pipe out o' his Mouth, an' says he, sort o' Sneerin', "All right, then; Supposin' *you* pull this Woman's tooth. Take her in the Woodshed ef you want to, while I wait on the Gentleman."

Then he Went In the settin'-room, an' Mis' Rowland she was blinkin' Offul Hard, like she couldn't believe her Ears, an' so I said to her that it was jis' a Private Joke about Betty, between me an' Dock, an' it wasn't only one o' Dock's Eccentricities. In a Minute Dock he seated the Gentleman in the Chair, an' he Shet the door, leavin' Mis' Rowland in the Hall. I Snuck in on the Sly, an' hid, to listen to what was agoin' on.

The Gentleman he never lost No Time gittin' down to Business; he took out a Full Set o' gold teeth, all slathered over with Vittles, an' he laid 'em in a Open Drawer of the Operatin' Tray, where they was a Handful o' Gold Cylinders scattered loose. Then he took out a Fat Purse, an' he skun off a Hunderd Doler bill from a Wad, an' he looked up at Dock Knowital, kind o' Significant, never sayin' a Word. Then he Skun Off another Hunderd Doler bill, layin' it on the other one. Still he never said a Word, an' neither did Dock. Well, he laid on top o' them two bills Three others, until they was Five Hunderd Dolers in the Pile. Then he spoke.

"I'll give any man that Pile that kin make me a Set o' Teeth that'll Stick," said he. Dock Knowital looked paralyzed. "Oh, I ain't no

Preacher, ef that's what you're a-thinkin'," he said. "I don't mind lettin' you know I'm a Sport. I mean what I say; the Money's yours, ef you kin meet the Requirements."

Dock he was beginnin' to Recover now. I guess he seen it was the Chanst of a Lifetime. Says the Man, "I've had three Sets o' Teeth made in this City, none o' them wuth a Cuss. A Feller Sport says to me yesterday, 'You go an' try Dock Contour. He made me a Good Set, an' ef anybody kin Fit you he Kin. So here I am, an' you jis' go ahead. But they've got to be done by tomorrow night, fer I'm agoin' to San Francisco, an' I don't expect to be back fer Six Months." I seen Dock's face Light Up like a Sunburst right away. Says he, "It's a Hard Job, sure 'nough, but ef I can't Fit you, my name ain't Contour." (That was such a Good Joke that Dock he Snickered right out, in Spite o' trying not to.) Then he took the Impressions, an' while he was Pourin' them I Snuck Out in the Woodshed, an' I took a big shingle an' drawed on it with some Red Chalk this here:

"Teeth pulled without Pane,
With Gass er Coke-ane,
Free, this Day only."

I seen I'd made some Poetry, an' I reckoned it would do all the better fer Drawin' Trade. So then I tied a String to the shingle, an' went round an' hung it below the Boss' Sign, beside the Front Door. I knowed it was about time fer the Stove Foundrymen an' the Gang o' men that works at the Glass Works to come along, an' I reckoned that out o' about Two Thousan' men an' boys they'd be some that would take Dock up on this Lib'ral Offer. I never said nothin' to him about it, though, an' in fact I never got a Chanst, fer jis' as I Snuck Back indoors, he called me in the Laboratory. He was in Offul Fine humor, by this time. Says he, reel Jubilant, "James, I've got a Important Job out o' that Gentleman. You see Dock Contour he's made him four er five sets o' Teeth that don't fit, so he, heerin' I was in charge o' the offis this Week, wants me to Try, an' not let Doctor Contour Know Nothin' about it, 'cause it might hurt his Feelin's. I'll git Ten Plunks fer the Job, an' I feel I've done you a Unkind Turn, keepin' you settin' on that Cheer all Day, so I want to give you this to kind o' even things Up."

With that he handed me a Doler. I was Struck Dum at first, an' says he, "Ef you'll promise never to tell Dock Contour nothin' about this, James, I'll give you another Doler tomorrow evenin'." I'd

ketched my Second Wind, by this time, so says I, kind o' Sly an' Cunnin', like I wasn't so sure it was enough to keep me from Tellin', says I, "Why not make it Three Dolers? An' pay me in Advance, so I won't accidentally let nothin' Slip while Mis' Contour er Betty is around?" So then he Scowled, but he Pulled Out Two Dolers More, in Quarters an' Dimes, an' I reckon it about Busted him. I took it all the Same, an' says he, "Now I'll haf to Borry two Twenty Doler gold pieces to make them Plates out of," never mindin' how mutch he'd jis' told me the Job would amount to.

While he was gittin' the Bite fer the Sport the bell rung, an' I seen a crowd of about Fifty Foundrymen standin' lookin' at my Sign, an' two o' them was on the Steps. I signed to them to Keep Still, an' then I explained that they musn't say nothin' about it's bein' free, 'cause the Boss had been kind o' Overrun, an' he was gittin' Irritated, an' mebbe he wouldn't do it fer nothin' ef he knowed it was some more o' the same Kind. So the men said they Wouldn't, an' presently three more come acrost the street an' Rung, an' when they'd Come In, an' after them three other parties of two to four each, some Irish, some Niggers, had Stomped In with their Muddy Feet an' was standin' waitin', the Hall it begun to smell like a Nest o' Woodchucks.

Then I told Dock, an' he Come Out, lookin' Irritated sure enough, an' the First Man he said he Couldn't Wait, it was Achin' so, an' Dock he never paid no Attention, but he said to Mis' Rowland, "You'll haf to go to the Dental College to git that Pulled. I can't be Bothered." Mis' Rowland she looked kind of appealin' to me, but I couldn't help her, with him a-lookin' on, so she said, "I trust I have not seriously inconvenienced you, Doctor," an' then she Went Out. Jis' then Dock he spied the Card a-layin' on a Chair, an' says he, "What's this, James?" An' I Left On like I'd seen the Lady put it there, but I didn't know what fer. So then I looked at it, an' says I, "Jee Whiz, Dock, me an' you has got in a Bad Box! That's Mis' Rowland, the Richest Lady in the City, an' we took her fer somebody's Washwoman! Here I've been a-listenin' to her talkin' about how the Boss he wasn't no account as a Dentist, an' she'd heered Dock Knowital was here keepin' office fer him a few days, an' she'd got a Big Lot o' work to be Done, her an' her three Daughters, an' she was bound to have some Young Dentist that was up to the Times do all their family's work hereafter, an' ef Dock Knowital wanted to

start in Practice here she could send him no end o' Ritch Patients, providin' he done her work right. An' me never payin' no pertickler Attention, 'cause I thought she was Weak-Minded, an' reely didn't only want to git a Tooth Pulled!"

All o' this was a Offul Whopper, of course, an' they's been times when I was agoin' regular to Sunday school, when I'd of been afeard to say sech a Fabrication. It was a Great Comfort to me to think how mutch Wuss a Liar Dock Knowital was. I seen Dock wanted to Choke me, yit Dasn't, so then he cussed Turrible, yit in a Low Tone o' Vois, 'cause he was Afeard the Sport might find out what it was all about, even ef he had took the Precaution to shet the Door into the Operatin' Room. But still the Sport was sech a Big Catch that he cooled off presently, an' he went back to his Work, never even Noticin' the Men in the Hall, bein' kind o' Dazed.

So then the bell it Kep' On a-ringin', an' men a-comin' in, holdin' their Jaws. Presently in come a Irish Woman. She cried out in Ixcited Tones, "Oi don't want no Toots pulled free; Oi want me False Toots made Roight. Docther Contour he made 'em wrong, an' Oi want to see um, roight aff, boy, an' yez'll tell um that." With that I opened the door an' says I, "There's a Women here, she says her False Teeth they ain't"— Dock he made a Quick Sign to me an' I stopped. The woman was raisin' Ned in the Hall by this time. Dock he Run Around through the Laboratory, so as he wouldn't haf to open the Hall Door an' let the Sport heer everything, an' he tried to Quiet the Woman.

An' while he was a-talkin' the bell rung agin, an' in come a Nother man. He wasn't no Irish er Nigger Foundry-Han' though, he was Mr. Rowland, the husband of Mis' Rowland, an' he's a Great Big man, an' I wouldn't want to be Alone with him in a Room, an' him a-lookin' the way he was a-lookin' now. Says he, "Is that young Pecker-Headed Squirt of a Dentist here?" Says I, "Set down, sir, an' I'll see." Dock he come to the Laboratory Door leadin' into the Hall jis' then, an' I opened the Door from the Hall into the Operatin' Room, where the Sport was, jis' as the Irish Woman was a-screamin', "Oi very well know yez ain't Docther Contour; yez er wan o' thim College Igneramusses, an' yez kin tell the Docther it ain't no good fer him to thry hidin' from me, fer O'll have um, ef Oi have to call the Perlice!"

Dock Knowital he turned Pale, at that, an' he kep' pushin' the

Woman out o' the Front Door. Then I seen it was time to Interfere an' set matters Right, so says I, to the Woman, "This is Doctor Knowital, an' he ain't responsible fer the mistakes Dock Contour has made, anyhow. He ain't reely only a Student."

I was holdin' the Operatin'-Room door shet all but a Crack, so as the Sport wouldn't Heer. Jis' then the Funniest Thing happened; the Sport he kind o' Pricked Up his Ears, like he had Heered, in spite of all, an' all of a Sudden he jumped out the Winder on the Sidewalk, an' disappeared round the Corner. Dock he must of Suspicioned he'd Heered, although I knowed he didn't see what had Happened, 'cause I'd only had the Door open the Least Crack. He made a Motion like he was agoin' to Ketch me by the Collar, an' Jis' then says I, pointin' to the Gentleman what was waitin', "This here is that lady's husband, Mr. Rowland. He said he wanted to see you right away." I said it as Ca-am as though I reckoned it was jis' what Dock was a-lookin' fer. Dock he caught Mr. Rowland's Eye at the instant. He never teched me. It seemed like it was a Snake Fascinatin' him.

I was thinkin' Offul Fast jis' then. I seen the Mud on the Hall floor, an' them Niggers an' Irish a-settin' there waitin', an' the Odor of Smell that Riz Up was curlin' the Paper off the Walls. I minded how Dock Knowital was sure to find the Shingle d'rec'ly, without he got Disabled in the Interview a-comin' on with Mr. Rowland, an' I thought o' the Things he'd say when he found the Sport had Vanished, an' how the Boss would Act when he Heered all I'd done. It was a Turrible Temptation to stay an' Umpire the Scrap that seemed likely to Come off in a minute, but I knowed I dastn't. I grabbed my Hat an' out o' the Winder I went, follerin' the Sport's Example. Says I, "Ef my Mother wants that Twenty-One Dolers She'll haf to Collect it some other Time. I'm done with the Boss an' the Intire Perfession."

Cincinnati, O. FRANK W. SAGE, D.D.S.

INTESTINAL ANTISEPTIC.—By the action of formaldehyd on amidobenzoic acid in hydrochloric acid solution, Hans Mehner *(Merck's Report)* obtained a red amorphous compound readily soluble in hot water acidulated with hydrochloric acid. Its formula is given as follows: $COOH.C_6H_4NHCH_2OCH_2NH.C_6H_4COOH$. The compound is said to possess disinfectant properties and to be eligible as an intestinal antiseptic in gout and rheumatism, as it checks butyric and lactic fermentation in the intestines.

The Dental Digest.

PUBLISHED THE FIFTEENTH DAY OF EVERY MONTH
At 2231 Prairie Avenue, Chicago,
Where All Communications Should be Addressed.

Editorial.

INSTITUTE OF DENTAL PEDAGOGICS.

Of the national dental organizations, the Institute of Dental Pedagogics is one of the younger members, and as it has not appealed directly to the general profession, nor sought for membership outside of those directly engaged in teaching in dental schools, its work has not become so generally known. Nevertheless, it is already one of the most widely influential organizations in dentistry, and the profession at large should know more about its work.

The organization has no individual members, as the membership is made up of dental schools, and some individual in each faculty is authorized by the school to act as its representative in the organization. However, when a dental college has become a member every individual of its faculty becomes a member, so far as the privileges of the floor in the presentation of papers and discussions are concerned. The business matters of the organization are conducted by committees outside of the hours of meeting, so that the whole time of each session may be given to the subject matter in hand.

The entire time of the meetings is given to the discussion of dental pedagogics, or the methods of teaching dental subjects in dental schools. This organization has nothing to do with legislation as to the conduct of dental schools. That matter is left strictly to the National Association of Dental Faculties. It is therefore free from the hostilities and embitterments that occur in legislative bodies and so often interfere with the discussion of practical and scientific questions. Its meetings are held during the Christmas recess of the schools, occupying two to three days, at a time when every teacher is fully alive to the work he has in hand and ready to engage in the discussion of his methods. The last of these meetings was held recently in Chicago, and upon dropping in at some of the sessions we were particularly impressed with the earnestness and high character of the papers and discussions.

This association was organized in 1893, at the time of the Columbian Dental Congress in Chicago, under the name of the National

School of Dental Technics. This was the result of the introduction of systematic courses of training in dental technics in our dental schools, which were first instituted in the Chicago College of Dental Surgery, at the instance of Dr. G. V. Black, in the session of 1887-8 in the prosthetic department, and in the operative department in 1888-9. A short paper explaining the basis of this work was presented to the Chicago Odontological Society by Dr. Black and discussed by it. After the institution of these courses of instruction they were rapidly taken up by other dental schools, so that in the organization of the National School of Technics in 1893 eleven schools participated, and within a few years a considerable majority of the dental schools in the United States were members of this organization. In the first meetings the time was wholly taken up in the discussion of the plans for carrying on the courses of instruction in operative and prosthetic technics, but as the uses of these courses became more generally understood and agreed upon, the teachers naturally sought other subjects for discussion, and there was some question as to admitting them. This resulted in changing the name to the Institute of Dental Pedagogics in 1899, and the admission to discussion of all subjects taught in dental schools, or of practical interest in dental teaching, but all discussions of legislative matters relative to the management of dental schools are still strictly avoided and delegated to the National Association of Dental Faculties.

The Institute publishes its proceedings, papers and discussions annually in a neat volume which is distributed to all of its members, but seems not to have a wider distribution. Within a few years the early volumes will be very difficult to obtain.

This body of teachers has simply grown up to meet the needs of the time, and is rapidly increasing in interest and power for good, and it seems to us that it is doing much to facilitiate and make better the work of teaching in our dental schools. It will aid in the development of dentistry, and will serve to crystallize and unify teaching methods in our calling by sifting out the false, useless or ineffective and establishing the true and effective methods. The Institute has great work to do in bringing teaching methods in our dental schools to that effectiveness which will satisfy the ever-increasing demand of the American people for more intelligent and effective dentistry. It should have the hearty support and encouragement of the entire profession.

Notices.

VERMONT STATE DENTAL SOCIETY.

The twenty-seventh annual meeting of the Vermont State Dental Society will be held at the Van Ness House, Burlington, March 18-20, 1903. All members of the profession are cordially invited to be present.

THOS. MOUND, Secretary, Rutland.

INSTITUTE OF DENTAL PEDAGOGICS.

At the tenth annual meeting of this organization, held in Chicago Dec. 29-31, 1902, the following officers were elected: President, J. D. Patterson, Kansas City; Vice-president, H. B. Tileston, Louisville; Secretary and Treasurer, W. E. Wilmott, Toronto.

CHICAGO ODONTOGRAPHIC SOCIETY.

At the annual meeting of the Chicago Odontographic Society in December the following officers were elected for the ensuing year: President, F. B. Noyes; Vice-president, J. P. Buckley; Secretary, F. H. Zinn; Treasurer, Geo. N. West; Board of Directors, F. E. Roach, L. O. Green, H. A. Drake; Board of Censors, D. M. Cattell, W. Girling, D. A. Hare.

COMPLIMENTARY BANQUET TO DR. CHAS. S. STOCKTON.

Jan. 21, 1903, at the New York Athletic Club, New York City, a complimentary banquet was tendered to Dr. Chas. S. Stockton of New Jersey by his friends, in commemoration of forty-five years of continuous dental practice. Dr. W. W. Walker was toastmaster, and toasts were responded to by Drs. E. T. Darby, S. G. Perry, B. Holly Smith, J. Allen Osmun, B. F. Luckey, R. Ottolengui, R. M. Sanger. Dr. Chas. A. Meeker was chairman of the committee of arrangements, and the affair was a grand success.

HONORING DR. PALMER.

A dinner was given at the New York Athletic Club, New York City, Oct. 25, 1902, in honor of Dr. S. B. Palmer of Syracuse, N. Y. Some thirty-five of the representative men of the dental profession were gathered together to do homage to their oldest scientist and one of their most honored and beloved members. It was the occasion of Dr. Palmer's eightieth birthday and fifty-third year in practice.

For the past forty years Dr. Palmer has been prominent in his profession and merits the honored position he now holds, and the love the profession bears him.

It has seldom been our pleasure to attend a reception where there was a greater expression of praise and esteem for the honored guest. Dr. Palmer's cup of happiness simply overflowed. He bore his laurels with the same

modesty and shyness that have always been marked features in his career.

Both the older and younger element of the profession were ably represented, and the impromptu speeches which came from their hearts' depths lasted far into the night.

Dr. A. H. Brockway of Brooklyn presided over the dinner in a most graceful manner. The modesty and simplicity with which he introduced the speeches were not only characteristic of his genial nature, but were most befitting to the occasion. In introducing Dr. Palmer he eulogized him as one of the leading pioneers and one of the greatest benefactors the profession has ever had. He dwelt at some length on Dr. Palmer's early work in the profession and his eagerness for education.

Dr. Palmer showed unusual vigor and strength for his years, and expressed his thankfulness for his health, as well as for this gratifying manifestation of love and respect. He gave a brief outline of how he obtained his early education in dentistry and of the creation of the "New Departure," which, step by step, has led this thought and work successfully, until he sees his views universally accepted. He predicted we were on the threshold of another new departure—Vital Physiology—which is briefly outlined below:

G. LENNOX CURTIS.

DR. PALMER'S SPEECH.

First Chapter. By the kind words spoken here to-night I am assured that my life has been spared to live down the so-called heresies of the New Departure, for which I am very thankful. Life is too short to engage in another departure—yet by the eye of faith, I can read the preface of the coming physiology something like this. Modern physiology teaches that life is energy, emanating from the Creator, which is the soul or spirit of matter. It is manifested in all matter, and may be recognized when matter in evolution has been raised from the elements into conditions to maintain life. Life is visible in vegetation, and in the lower animals, ascending to the highest creation, man. Electricity, as has been taught in physics, has been the agent to unite the elements to form masses, to prepare for vegetable life.

Second Chapter. Life appears as seen in the vegetable kingdom, and in addition, there is instinct manifesting guidance to seek moisture through the rootlets; also life and light through the foliage. This teaches co-operation betwen the soil and sunlight. The communication is through the sap, which to the tree or vine is as the blood to the animal; not only that, it is an electrical conductor between the positive pole, the foliage, and the roots, which are negative. Cut off the tallest vine at the root, and it withers and dies directly. Thus electricity has undergone evolution, and is adapted to the growth and needs of vegetation. The florist knows that flowers undergo civilization by proper cultivation, and fall back by neglect.

Third Chapter. The third chapter teaches that the "clay," so to speak, of which man is made is of a finer quality. Added to instinct, man has mind, will, thought and reason. In past works on physiology there seems to be no scientific connection between those attributes and the body, nor had

science advanced to a degree which could afford demonstration. What has been understood as the "Electro-Chemical Theory" has been taken as the basis of this work, namely: Man is considered an organic living dynamo, the system being run by electrical currents, which are mainly generated from positive and negative food elements taken into the stomach. The stomach is a vital cell; the elements are organic, and by the process formerly called "digestion" pass through the process taking place in a fluid cell of zinc, copper or carbon, in appropriate fluids, in the laboratory. Currents thus generated we call physical electricity. The electricity which is generated in a living cell from organic elements is called vital or organized electricity. Mind, will, etc., are phases of electricity. Life as mentioned is energy back of our knowledge. We see its manifestation in man, which is the most convincing phase of mental electricity of any hitherto set forth. For instance, consider brain and muscle storage batteries for vital electricity, and each organ a station commissioned to do its work under direction of life's agent, electricity. Thus in dentistry the deciduous teeth conform to the side of the jaws, later on the roots are absorbed and the permanent teeth take their place. This process seems simple when it is considered electrically. Life directs the deposit to build up, and reverses the current to absorb the roots. Each process is conducted in time and in order, as teeth are in pairs, and adapted to their position in the jaws.

Fourth Chapter. The fourth chapter teaches the relation of mind to matter, which is demonstrated by electricity generated from organized elements. In telegraphing the mind directs the fingers to manipulate the key by which symbols of words are put in circuit to a receiving operator, who translates and delivers the message. This illustrates nothing different from writing letters except the mode of conveyance. The invention of the telephone, aside from the uses for which it was designed, has furnished demonstrations which warrant the introduction of the teachings to be found in this new physiology; that is, mind, thought, will, etc., are phases of intellectual electricity that relate to the body and belong to science for discussion, as truly physiological or mental science has done hitherto. This work teaches that the gulf between physical science and mental science has been bridged over. It does not include metaphysics proper, but science in connection with thought, will and reason, relating to present life here and now. As an illustration: It is well understood that the voice of a speaker is borne on the air by wave sounds that are set in motion by the vocal organs. Also that the voice cannot be heard at any great distance. The vocal organs are under mental control and direction through life's energy, conveyed to the organs by vital electricity. The process seems simple by which vital electricity is converted into physical electricity, and again reconverted into speech, even in the voice of the transmitter. The waves of sound strike a disk, which in effect corresponds with a telegraph key, though with inconceivable rapidity. Thus the impressions are carried forward with lightning velocity at the receiving end of the line, by a receiver, and speech is restored. Mental electricity inspired the vocal organs to do life's bidding;

by physical electricity the message is carried and delivered in the tone and spirit of the author of the message. Wireless telegraphy teaches not only the same principle, but an advance lesson in inspiration, and man's relation to Divinity. This doctrine does not strictly belong to dentistry, but is predicted as belonging to science of life in life. Science is truth, and divine. It will, in the Creator's good time, do away with fallible traditions and inspirations. One great hindrance to the world's progress is looking backward for light and guidance instead of forward. Inspiration is open to man now as it has ever been. When individuals can have faith in the Divinity within, and more courage to think for themselves, they will hold to all truths vouchsafed in the past, and as a foundation upon which to stand and receive new light, and new truths, that Divinity offers to all mankind who can reverently trust the conditions upon which they are offered. The trend of investigation indicates that the discovery may soon be announced that electricity is an element which is the connecting medium between mind and matter, or between man and his Maker. Such discovery would solve the mystery which at present shrouds electricity, and it would stimulate Man to come into closer communion with his Maker.

News Summary.

G. DECKER, 63 years old, a dentist at Corunna, Mich., died Dec. 18, 1902.

J. MAGEE, a dentist at Rushville, Ind., committed suicide Dec. 29, 1902.

WM. E. WEIS, 29 years old, a dentist at Ottawa, Ill., died Dec. 31, 1902.

G. L. ELLIOTT, for many years a dentist in Detroit, Died Dec. 24, 1902.

C. B. BAKER, 44 years old, a dentist at Bridgeport, Conn., died Dec. 23, 1902.

E. S. PETTIT, 33 years old, a dentist at Beloit, Wis., died Jan. 9, of peritonitis.

E. E. BASSETT, a Chicago dealer in dental rubber, was adjudged insane Jan. 15, 1903.

E. COLLINS, 75 years old, a dentist at Little Rock, Ark., died Jan. 2, 1903, from apoplexy.

G. W. KENDALL, at one time a prominent dentist, died Jan. 2, 1903, at Shreveport, La.

C. D. ELDER, 31 years old, a dentist at Bellevue, Pa., died Dec. 23, 1902, from hemorrhage.

A. W. HOWLAND, 58 years old, a dentist at Lawrence, Mass., died Jan. 7, 1903, from grip.

C. F. HOWELL, 40 years old, a dentist at Rochester, N. Y., died Dec. 31, 1902, of heart disease.

ETHYL CHLORID.—In cold weather, when making use of chlorid of ethyl for local anesthesia, it is well to warm the part beforehand. This will secure better evaporation and more complete anesthesia. It also prevents waste,

as a much smaller amount of the chlorid of ethyl will produce the required degree of anesthesia.

A. E. SMITH, 45 years old, a dentist at Jamestown, N. Y., died from apoplexy Dec. 28, 1902.

DIVORCE.—Dr. B. A. Bigelow, a Toledo dentist, is defendant in a divorce suit brought by Mary Bigelow.

J. T. KENNEDY, 24 years old, a dentist at Chicopee, Mass., died Dec. 31, 1902, from tubercular laryngitis.

W. C. CHAPMAN, 26 years old, a dentist at Waterbury, Conn., died Dec. 21, 1902, of typhoid-pneumonia.

A. L. PECK, a dentist at Spencer, Ia., fell from the window of his office Jan. 14, and sustained fatal injuries.

J. H. MARTIN, 55 years old, and for many years a dentist in Chicago, died Jan. 8, 1903, from inflammation of the heart.

ACHING TEETH CAUSE SUICIDE.—A farmer in Illinois recently suffered so severely from toothache that he hanged himself.

E. T. JOHNSTONE, a dentist at Pelton, Mich., is alleged to have confessed setting fire to a hotel to secure the insurance on his dental outfit.

B. H. SMITH, the father of Dr. B. Holly Smith, died Dec. 19, 1902. He was one of the oldest ministers in the Baltimore conference of the M. E. church.

WESTERN INDIANA DENTAL SOCIETY held its annual meeting Jan. 12, 1903, and elected the following officers: President, R. A. Adams; Secretary and Treasurer, W. W. White.

DAMAGE SUIT.—Jan. 15, woman at Oklahoma filed suit against a dentist for $5,000 damages, alleging unskillful work on a tooth, which resulted in injury to the eye and jaw bone.

THE CARE OF THE TEETH.—By Samuel A. Hopkins, M. D., D. D. S., Professor of Theory and Practice of Dentistry in Tufts College Dental School. New York, D. Appleton & Co., 1902.

SPITTOON CAUSES DAMAGE.—The fountain spittoon in the office of a dentist at Salem, Mass., overflowed during the night recently and caused $500 damage to the clothing stock on the floor below.

DENTISTRY AT COST.—A charitable organization at Cincinnati has made arrangements whereby its inmates can have their dentistry done at cost by some of the best practitioners in the city.

WOUND FROM TEETH FATAL.—During a fight a man in New York recently cut his knuckles on his opponent's teeth. Blood poisoning set in and progressed so rapidly that nothing could be done to save the unfortunate man's life.

EXAMINING BOARD AFFAIRS.—At the last meeting of the Ohio State Board of Dental Examiners only six out of sixteen applicants were successful.—At the last meeting of the Minnesota State Board nine out of nineteen applicants passed the examination.—Drs. H. W. Campbell, Suffolk, and R. E.

Simpson, Fincastle, have been appointed on the Virginia State Board of Dental Examiners.—E. H. Styles, Tucson, has been appointed a member of the Arizona State Board.

FREEPORT (ILL.) DENTAL SOCIETY held its annual meeting Dec. 23, 1902, and elected the following officers: President, E. H. Allen; Vice-president, C. L. Snyder; Secretary and Treasurer, E. H. Place.

LORAIN COUNTY (O.) DENTAL SOCIETY held its annual meeting Jan. 13, 1903, and elected the following officers: President, E. S. Kiplinger; Vice-president, J. G. Wherry; Secretary and Treasurer, D. S. Husted.

SOCIETY MOLARS.—Dentist—"Well, how do the new teeth work? Everything satisfactory?" Patient—"Not exactly. They seem to cut the others." Dentist—"Naturally. They don't belong to the same set, you know."

DIVORCE BECAUSE OF FALSE TEETH.—A woman in Paterson, N. J., is suing her husband for divorce because he not only destroyed her set of false teeth, but ridiculed her appearance and would not allow her to have another set.

FOND DU LAC (WIS.) DENTAL SOCIETY was organized Jan. 20, 1903, and the following officers were elected: President, A. H. Gillett; Vice-president, J. L. Blish; Secretary and Treasurer, W. C. Wise; Board of Censors, C. A. Cheney, H. T. Sackett, W. E. Tennant.

LACKAWANNA AND LUZERNE COUNTY (PA.) DENTAL SOCIETY held a meeting Dec. 23, 1902, and elected the following officers: President, N. H. Myers; Vice-president, C. C. Laubach; Secretary, E. E. Eilenberger; Corresponding Secretary, R. S. Meixell; Treasurer, G. C. Knox.

PLATE ALMOST FATAL.—A Denver citizen recently had a false set of teeth inserted, and neglected to remove them upon retiring. During the night they slipped into his throat, and it required two doctors and a stomach pump to clear the obstruction and bring him back to life.

LOCATIONS.—According to newspaper reports, Island Falls, Me., is now without a dentist.—The United States Consul at Tamatave, Madagascar, states that there is a good opening in that country for an American dentist, as there is now only one practitioner there and he is a native.

COMPREHENSIVE.—The following notice is to be seen over a little country store in Georgia: Jonathan Wilkins. Ice cream in season and embalming on reasonable cash terms. Also millinery and tooth pulling. Boots, shoes, books and bacon. Coffins on the installment plan.—*Printers' Ink.*

ADVERTISERS BARRED IN ATLANTA.—According to newspaper report, the big office buildings in Atlanta, Ga., make every dentist sign an agreement to the effect that he will vacate his lease if he does any unethical advertising, and they will not rent to a man who has the reputation of being a quack advertiser.

MORE COMPLIMENTS.—"Continue to send me the DIGEST. I would not be without it for three times the money." H. A. Chandler, Sandusky, O.—"In my opinion the DIGEST is the best dental journal." M. W. Walthen, Salineburg, Ky.—"Send the DIGEST for 1903. I consider the entertainment offered by Dr. Sage's office-boy stories worth more than the subscription price of

your journal." D. F. Strock, Huntingdon, Pa.—"I want the DIGEST, and want it bad. Can't do without it, as it's the best to-day, and all alive." T. A. Quinlan, Brooklyn.

GLANDS OF NECK ENLARGED BY ABSCESSED TOOTH.—Dr. A. M. Vance in *Louisville Medical Journal* cites the case of a man with enlarged glands in the left side of his neck. A dentist extracted a decayed third molar and found an abscess on the end of root. The patient made a rapid recovery.

ROBBERIES.—Jan. 1 a dentist at Worcester, Mass., lost $50 through thieves. —Dec. 29 a dentist at Cleveland was robbed of $65 worth of material.— Recently a thief broke into the office of Dr. W. J. Starbuck, Boston, but unexpectedly found the doctor there, and he single-handed landed the intruder in the police station.

A TEXT-BOOK OF SURGICAL PRINCIPLES AND SURGICAL DISEASES OF THE FACE, MOUTH AND JAWS FOR DENTAL STUDENTS.—By Horace H. Grant, A. M., M. D., Professor of Surgery and of Clinical Surgery in the Louisville College of Dentistry. Published by W. B. Saunders & Co., Philadelphia and London. 1902. Price, cloth, $2.50 net.

SHOCKED WHILE OPERATING.—Recently a dentist at Lafayette, Ind., was holding the handpiece of his electric engine in one hand and attempted to light the gas, touching the fixture while so doing. He received an electric shock that knocked him to the floor and rendered him unconscious. Besides a bad burn on his hand he was laid up for several days.

UNDER OBLIGATIONS.—Not long ago at a provincial hospital an old woman, who was being discharged completely cured, was having a last interview with the house physician. "Well," he said, "you'll have to speak well of the hospital now, won't you?" And the old woman replied: "Ay, that I will, doctor. But, sure, I never spoke ill of it. My 'usband died here."

AGE LIMIT FIXED BY DENTISTS.—In the November DIGEST we stated that factory inspectors in Illinois were enlisting the aid of dentists to tell by the teeth the age of children who seemed too young to work in factories. There is now a bill before the Illinois legislature providing that no factory owner shall employ a child who cannot produce a certificate from a dentist showing that he is over sixteen years of age.

ILLEGAL PRACTITIONERS.—The students in one of the St. Louis dental colleges have been practicing dentistry on unsuspecting patients in their rooms, but the state board broke up the game.—The dentists throughout Ohio, are complaining that during the holidays college students went through the state doing what dentistry they could and advertising all sorts of things. —A dentist at Brooklyn has been arrested for practicing without a license.

ACCIDENTS.—A young man in Canada recently took gas before having a tooth extracted. He came out from under the influence all right and no bad effects were apparent until two hours later, when he suddenly became unconscious and remained so for several hours.—A woman in Michigan last month was picked up in an almost dying condition, and after she had been revived at the hospital she stated that the trouble came from an overdose

of cocain which a dentist had given her in extracting some teeth.—A woman at Columbus, O., recently took chloroform prior to tooth extraction, and was made terribly sick for some time thereby.

EXCLAMATORY RHEUMATISM.—Martha, the colored washerwoman, was complaining of her husband's health to one of her patrons. The *Christian Register* reports the dialogue: "He's ve'y po'ly, ma'am, ve'y po'ly. He's got dat exclamatory rheumatism." "You mean inflammatory, Martha. Exclamatory is from exclaim, which means to cry out." "Yes, miss," answered Martha, with conviction, "dat's what it is. He hollers all de time."

ADVERTISING EXTRAORDINARY.—Dr. J. S. Goodridge, a dentist in Chicago, advertises his services, making all the claims that the advertising gentry usually do. However, he goes a little beyond anything we have seen and says, "By diploma, D. D. S. and L.D. S., gold medalist and first prizeman. The experienced and gentle dentist, so that the most nervous need not fear. Ask to see my testimonials from many of the court ladies and nobility of Europe whose teeth I have put in order when traveling in that country."

DENTAL ANALGESIA BY ELECTRICITY.—Regnier, chief of the laboratory of electrotherapy at the Charité, Paris, and Didsbury, dentist to the hospitals, announce that the means of obtaining the analgesia of a living tooth has been discovered. It is the application of the high frequency current to the gum and tooth for three to five or possibly eight minutes. They use a current of 150 to 300 milliamperes with electrodes of "stent" lined with tin foil. The gum must first be washed with permanganate and alcohol and the chair be entirely free from any metal parts. Teeth can be extracted or scraped without pain during the analgesia thus induced.—*Progres Medical.*

FIRES.—E. O. Pigeon, Washington, D. C., Dec. 26, loss $50.—E. A. Taylor and O. B. Hayden, Chicago, Jan. 2, loss $900.—Geo. Burns, Jan. 18, Elkhart, Ind., loss $50.—A. Hallenberg and T. H. Sherman, Fargo, N. D., Jan. 9, total loss.—T. W. Haines, Gloster, Miss., Dec. 25, loss $500, insurance $200. J. P. Cromwell, Glens Falls, N. Y., Dec. 26, total loss.—A. G. Duncan, Zelienople, Pa., Dec. 28, loss $1,000, insurance $300.—J. K. Campbell, Temple, Tex., Dec. 16, loss $500, fully insured.—McGovern & Drew, Burlington, Vt., Jan. 15, loss $200, insured.—D. G. Barnitz, Christiansburg, Va., Jan. 14, $1,000, insurance $600.—Zeigler & Thrift, Berlin, Wis., Dec. 29, loss $300.

AUTOMATIC RETRACTORS OF THE TONGUE.—M. Laborde presented at the Académie de Médecine two models of automatic tractors of the tongue; one acts by a clock movement, the other is acted on by an electric motor; an accumulator enables the apparatus to work for six hours (*Gazette hebdomadaire*, June 29, 1902). On this occasion M. Laborde presented a case of M. Paul Delbet's, in which the patient, after suffering from a grave syncope from chloroform that had resisted all the classical means, was restored to life by means of rhythmic traction of the tongue. An interesting fact is that these tractions are of no power so long as they are made by holding only the extremity of the tongue. They become more active from the moment that the whole anterior part of the tongue is grasped. M. Laborde has insisted in all his preceding communications on the necessity of holding at

least one-third of the anterior part of the tongue, otherwise no action is communicated to the larynx, and its nervous organs are not brought into play.

FESTIVE STONECUTTER.—"I suppose," said the facetious doctor to the carver of monuments, "you finish your grave-stones as far as 'In Memory of,' and then wait for some one to die?"

"Yes," answered the stonecutter with a grave smile, "unless they are for patients of yours, in which case I keep right on."

"How," continued the doctor, "do you correct your errors after the stones are lettered?"

"That's easy; a widow who trades with me got me to engrave on her husband's tomb, 'The light of my life has gone out.' When she married again we added, 'but I have struck another match.'"—*Ex.*

LEMON JUICE A GERMICIDE.—The publicity given in the daily press to a cablegram alleging that lemon juice was a powerful germicide, with especial reference to the typhoid bacillus, has led the Chicago Health Department to experiment, with the following preliminary results:

The following experiment was made in the laboratory to test the value of lemon juice in destroying the typhoid bacilli: One hundred and twenty c.c. of bouillon was inoculated with the *Bacillus typhosis.* The flask was placed in the incubator at 90 degrees for 12 hours. At the end of this period 4 c.c. of lemon juice was added. At the end of four hours plates were inoculated from this flask. The plates at the end of 24 hours showed no growth.

Further investigations will be made, and the department says lemon juice may be recommended as a prophylactic if results prove its value.

NASAL OBSTRUCTION.—Harry Campbell believes in the correctness of Whitehead's statement to the effect that nasal obstruction is capable of producing deformity of the maxilla. The resulting deformity constitutes a distinct pathological entity which the writer suggests should be called the mouth-breather's jaw. The narrowness of the hard palate in these cases gives it a false appearance of height. The writer refers to one etiological cause of this deformity—a reduction of atmospheric pressure in the nasal cavities, which induces a negative pressure within the antrum, and so prevents ample expansion of it, which is essential to the proper development of the maxilla. In the many hundreds of skulls which Campbell has examined in the museums he has not found one unmistakable instance of the mouth-breather's jaw, while there are hundreds of thousands of such jaws among the present inhabitants of London.—*British Med. Jour.*

LUPUS OF FACE TREATED WITH ICHTHYOL-SODIUM.—The patient was a lady seventy-seven years old, who ten years ago was attacked with an indolent ulcer which appeared inside the nostril. Gradually the ulcer spread, until the whole of the nose, lips, chin and cheeks were one mass of nodules and ulcers. For the first three years the patient was very weak and generally ailing; during the last seven years she has, but for occasional attacks of bronchitis, enjoyed fairly good health. The treatment which was followed

in this case, and which resulted in so signal a recovery, consisted in the application of thirty per cent ichthyol-sodium and castor-oil. By persevering with this treatment the area of ulceration was gradually reduced until the disease was confined to the nose, whence it had started; after several months even that locality became cured. There has been no recurrence.—*Treatment.*

HEMOPHILIA.—Dr. A. J. Ochsner of Chicago gives a method of treatment in cases of hemophilia, which has not been published. It consists in giving albumin in the form of the whites of eggs. When from four to six whites of eggs are given three times daily there seems to be a very definite effect exerted upon the clotting properties of the blood of these persons. He adds that Mayo Robson has prescribed dram doses of chemically pure chlorid of calcium, largely diluted, three times daily, or as an enema, every four hours for four days, in cases of hemorrhages accompanying cholemia.

VINCENT'S TONSILLAR ULCER.—Dr. W. N. Berkeley presented a child of six years having the Vincent tonsillar ulcer. Two nights ago the child complained of sore throat, and when first seen by the speaker yesterday there was slight fever, but no great constitutional disturbance. Examination showed a minute sloughing area over the upper margin of the right tonsil, about one-eighth of an inch in diameter. On pushing the slough aside with a swab, an excavated ulcer, about half an inch long, was revealed. Smears from it showed typical spirillæ and the elongated bacilli described by Vincent. The precise relation of the bacilli to the spirillæ was not yet understood. As regards the treatment, nothing was necessary, except the use of antiseptic washes and liquid diet. Dr. J. Sobel, about one year ago, had described a series of these cases, and since that time a number of others had been reported.

Dr. Charles Herrman said that while there was no doubt about the diagnosis in this case these ulcers did not ordinarily present quite such a sharply defined margin, and were more of a greenish-brown color. The bacteriology of this disorder was still but little understood, and he thought in the future it would be shown that this form of ulceration occurred in other parts of the body than the throat.—*Medical Record.*

IODOFORM GAUZE PLUGGING.—Von Bergmann describes his method of plugging with iodoform gauze in resections of the upper jaw, operations on the tongue and total extirpation of the larynx. He leaves the tampon undisturbed in the jaw for several days—even as long as ten days—before removal, and on removing finds the wound partially cicatrized and the remainder with healthy granulations. He had been fortunate in avoiding infection of the wound in this way in every case, except one in which erysipelas occurred. To avoid pneumonia from aspiration he has performed preliminary tracheotomy and plugging of the trachea in most cases. In extirpation of the tongue by Langenbeck's method, he tampons the whole wounded surface. In total extirpation of the larynx he plugs the large wound cavity on either side of the pharynx between it and the lateral muscles of the neck with iodoform gauze, which very soon adheres firmly by suction. At present he considers that an essential part of the after-treatment consists in completely

shutting off the trachea from the oral and pharyngeal cavity by suturing it to the external skin at the lower angle of the mouth and by forming two lateral cutaneous flaps, which are then united above the trachea with the posterior circumference of its transverse section, thus enclosing the trachea by skin. To avoid the flowing of saliva or mucus into the trachea from the part of the wound which lies above these two flaps he carefully stuffs that part with iodoform gauze tampons.—*British Med. Jour.*

SUBSTITUTE FOR X-RAYS.—Years ago Becquerel found that salts of the rare metal uranium possessed the power of throwing off a feeble and invisible radiance that affected photographic plates, like the x-rays.

Mme. Curie, in Paris last year, isolated from the Bohemian mineral pitchblende two other elements that behave in the same manner, but are far more active. One of them she called "polonium" and the other "eadium." The latter is said to be one hundred thousand times as intense as uranium in its photographic effects.

The property of the new metal is apparently of great practical value. The results of the x-rays, now so useful in surgical diagnosis, can be duplicated by a method much cheaper. Radium seems to suffer no diminution of energy or loss of weight during the process. In addition to producing an impression on the photographic plate, radium produces phosphorescence and discharges electrified bodies. Thus it will be seen that it possesses all the qualities of the Röntgen rays.—*Scientific American.*

MARRIED.—J. W. Babb, Lincoln, Ill.; Alma Betts, Keokuk, Ia., Dec. 25.—H. F. Breck, Springfield, Mass.; Grace Taylor, Springfield, Jan. 7.—Chas. Brecheisen, Ada, O.; Bertha Dobbins, Ada, O.; Jan. 1.—D. Butchers, Bunceton, Mo.; R. E. L. Farnsworth, Ft. Scott, Kans., Sept. 15.—J. H. Graham, Lead, S. D.; Sadie Moore, Lead, S. D., Dec. 24.—E. P. Graves, Cleveland, O.; Fannie Smith, Cleveland, Jan. 3.—H. C. Kettell, Jefferson, Ia.; Miss Huston, Sidney, Ia., Jan. 1.—J. E. Keen, Rocky Mount, Va.; Fanny Divers, Rocky Mount, Dec. 23.—A. R. Lord, Clyde, O.; Sarah Beebe, Vickeny, O., Jan. 7.—W. Matthews, Maysville, Ky.; Josie M. Turner, Eminence, Ky., Jan. 15.—W. E. Scott, Lynnville, Tenn.; Minnie Bryant, Bigbyville, Tenn., Dec. 23.—Chas. Urie, Greeley, Colo.; Lena Hail, Greeley, Colo., Dec. 24.—H. M. Viel, Delphos, O.; Sarah Waldo, Rising Sun, Mich., Dec. 23.—F. H. Weiland, Redfield, S. D.; Sarah C. Sullivan, Iowa City, Ia., Dec. 31.—S. E. Wcolfe, Guaymas, Ariz.; Camilla Canez, Guaymas, Jan. 15.

PRECAUTIONS NECESSARY WITH HYDROGEN-DIOXID.—Two professors at Lyons, France, have recently called attention to the ready absorbability of hydrogen-dioxid and the consequent danger of fatal gaseous embolism from bubbles of oxygen forming in the blood after absorption, when it is applied to an open wound or to detach an adherent dressing. In contact with the blood, as with pus, the effervescence continues. The oxygen is disposed of by the oxyhemoglobin in the blood if the amount is small, and no harm results. Inflamed tissues are peculiarly active in decomposing the dioxid, and absorption is always slow and gradual in all cases. Crolas advises rendering the dioxid alkaline by adding a saturated solution of sodium borate,

a drop at a time, until litmus paper, first reddened by the dioxid, regains its blue color. Even aside from the fear of gaseous embolism the dioxid should always be neutralized, as it is liable to contain more or less sulphuric, phosphoric or other acids. It should never be used stronger than eight to ten volumes, and always fractioned and in moderate amounts. With these precautions there need be no fear of the slightest evil effects from its use.—*Pacific Medical Journal.*

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